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ABSTRACT

Three experiments concerning the modification of student behavior problems in the classroom are described. Experiment I analyzed the differential effects of three different treatments (token reinforcement, social reinforcement, cost contingency or negative reinforcement) in the modification of deviant behavior in an experimentally controlled classroom setting. Results showed that a treatment model consisting of social reinforcement, tokens, and cost contingency was very effective in modifying behavior. Token reinforcement produced the greatest increase in appropriate behavior, followed by cost contingency, social reinforcement, and change of setting. Cost contingency produced the most consistent and least variable behavior across all subjects. A substantial treatment effect was also associated with change in classroom setting, teachers, and instructional materials. Experiment II evaluated a teacher training procedure for facilitating post-treatment maintenance of appropriate behavior. Experiment III replicated the treatment model (token, social, and cost contingencies) on a second group of students with deviant classroom behavior. (KW)

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REPORT NO. 5

COMPONENTS ANALYSIS AND SYSTEMATIC REPLICATION OF A TREATMENT MODEL FOR MODIFYING DEVIANT CLASSROOM BEHAVIOR

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Monograph

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COMPONENTS ANALYSIS AND SYSTEMATIC REPLICATION OF A TREATMENT MODEL FOR MODIFYING DEVIANT CLASSROOM BEHAVIOR

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A number of different techniques for modifying classroom behavior have recently been reported in the behavior modification literature. These classroom management techniques include token reinforcement (Wolf, Giles, & Hall, 1968; O'Leary & Becker, 1967; Quay, Sprague, Werry, & McQueen, 1966; Clark, Lachowicz, & Wolf, 1968; McKenzie, Clark, Wolf, Kothera, & Benson, 1968; and Bushell, Wrobel, & Michaelis, 1968); teacher attention and social reinforcement (Thomas, Becker, & Armstrong, 1968; Hall, Lund, & Jackson, 1968; Ward & Baker, 1968; Becker, Madsen, Arnold, & Thomas, 1967; and Wasik, Senn, Welch, & Cooper, 1969); timeout (Wolf, Risley, & Mees, 1964; Hamilton, Stevens, & Allen, 1967; Tyler & Brown, 1967; Wahler, 1969; McReynolds, 1969; and Bostow & Bailey, 1969) and cost contingency (Weiner, 1962, 1963, 1964a, 1964b, 1965; Siegel, Lenske, & Broen, 1969; Phillips, 1968; McIntire, Jensen, & Davis, 1968; Bailey, Wolf, & Phillips, 1970; and Hall, Axelrod, Foundopoulos, Shellman, Campbell, & Cranston, in press). Teacher attention and praise have been used in numerous studies to modify the study behavior of minimally disruptive children. Token reinforcement, timeout, and cost contingency have more often been applied to more deviant classroom behavior. The effectiveness of these variables when used in isolation, or in combination with each other, has been well documented (O'Leary & Drabman, 1971; Hewett, 1967; Bostow & Bailey, 1969; Patterson, Shaw, & Ebner, 1969; and Walker, Mattson, & Buckley, 1971).

Several studies have analyzed other combinations of treatment variables in the modification of minimally disruptive classroom behavior.

Thomas, Nielsen, Loretta, Kuypers, and Becker (1968) used social reinforcement from the teacher and remedial instruction to eliminate a classroom behavior problem. The effectiveness of rules, praise, and ignoring, as elements of elementary classroom control were examined by Madsen, Becker, and Thomas (1968). They found that rules alone had little influence upon classroom behavior. However, the combination of ignoring inappropriate behavior and showing approval for appropriate behavior was very effective in achieving better classroom behavior. O'Leary, Becker, Evans, and Saudargas (1969) evaluated the effects of classroom rules, educational structure, teacher praise, and token reinforcement in changing disruptive classroom behavior. In contrast to the Madsen, et al. (1968) findings, rules, structure, and the combination of praising appropriate behavior and ignoring inappropriate behavior were generally not effective in reducing disruptive behavior. This combination of variables was effective in nearly eliminating the disruptive behavior of only one of the seven children in the study. When the token reinforcement program (rules, structure, praise and ignore, tokens, and backup reinforcers) was introduced, however, the frequency of disruptive behavior decreased in five of the six remaining children. Subsequent withdrawal and reintroduction of the token program proved it to be a powerful variable in reducing disruptive behavior.

It appears additional research is needed to isolate effective combinations of treatment variables for modifying deviant classroom behavior and to determine precisely the contribution of each in producing an overall treatment effect. Baer, Wolf, and Risley (1968) suggest that current behavioral procedures are complex and often diffuse in their application. They argue that when these approaches succeed, they clearly need to be analyzed into their effective components.

Additional research is also needed to develop effective methods for training teachers in the application of validated treatment techniques. Many studies reported in the literature have used the teacher primarily as a vehicle for investigating the effects of teacher attention upon study behavior (Hall, Panyan, Rabon, & Broden, 1968; Becker, Madsen, Arnold, & Thomas, 1967; Hall, Lund, & Jackson, 1968). There is very little data available on the question of how much or what types of training are required to equip the classroom teacher with the necessary skills to implement behavior management procedures with a minimum of supervision. O'Leary and Drabman (1971) have pointed out that although it has been demonstrated that a teacher can successfully reduce disruptive behavior using a token program, no precise description is available of the training necessary for a teacher to implement a token program successfully.

Walker, Mattson, and Buckley (1971) and Walker and Buckley (in press) have trained regular classroom teachers in behavior management techniques in an attempt to program maintenance of child behavior following treatment in a token economy within an experiment classroom. Results of these studies suggest that behavior maintenance following treatment is heavily mediated by the regular classroom teacher. If the classroom teacher is well trained in behavior management techniques, she may be able to facilitate maintenance of treatment effects to a much greater extent than a teacher who has not received such training.

The present study had three major objectives. The first was to analyze the separate effects of token reinforcement, social reinforcement, and cost contingency in the modification of deviant classroom behavior within an experimentally controlled setting. The second objective was to

evaluate the effectiveness of a teacher training procedure in facilitating maintenance of appropriate classroom behavior during a post-treatment follow-up period within each child's regular classroom. The third objective was to replicate the treatment model (token reinforcement, social reinforcement, and cost contingency) upon a second group of children similarly exhibiting deviant classroom behavior.

Three experiments are reported in this paper. Experiment I describes a functional analysis of three treatment components in modifying deviant classroom behavior. Experiment II describes a teacher training procedure designed to facilitate post-treatment maintenance of appropriate behavior. Experiment III replicates the treatment model upon a second group of deviant subjects. The same group of subjects was used for Experiments I and II.

Method

Subjects

Two groups of five subjects were selected for the study. The first group consisted of four boys and one girl; the second of five boys. The children ranged in age from six to nine years and were enrolled in grades one, two, or three.

Children were referred from elementary schools in the local school district because of disruptive or deviant behavior occurring within the regular classroom setting. All subjects were screened using behavior checklist ratings, standardized individual intelligence tests (WISC; Stanford-Binet), achievement tests, standard auditory, visual, and

general health tests, and behavioral observations taken in the regular classroom. The subjects selected met the following criteria: (1) high scores on the acting-out subscale of the Walker Problem Behavior Identification Checklist (Walker, 1970); (2) high rates on such observable behaviors as noisy, aggressive, movement around the room, inappropriate peer interaction, and nonattending; (3) average or above average scores on the intelligence tests; (4) inadequate academic performance (educational deficits in the basic skills areas for the two groups ranged from 3 months to 1.5+ years); (5) no gross physical or sensory deficits; (6) extremely low rates of appropriate behavior in the regular classroom setting relative to their peers. (Group one averaged 34 percent appropriate behavior during baseline while group two averaged 38 percent.)

Setting

The experimental classroom facilities were adjoining and affiliated with a public elementary school in the Eugene School District. The primary area for academic activities contained six double desks (approximately 20" x 45" work surface), the teacher's desk, shelves and tables for the display of high interest materials for science and art projects and a carpentry room with a variety of tools and wood. Adjacent rooms provided sink and table facilities and an observation area with a one-way mirror. Space was also available for individual testing, tutoring, and remedial instruction. A small isolation (timeout) room containing a chair and desk, adjoined the classroom (Fig. 1). The children used the same playground and lunch facilities as the regularly enrolled students in the school.

Insert Figure I About Here

The children were in the experimental class daily for approximately 3 hours and 45 minutes. Of that time, approximately 2 hours and 50 minutes were devoted to academic assignments, 45 minutes to P.E. and recess and 10 to point counting and exchanging tokens for backup reinforcers at the end of the day.

The total staff consisted of a full-time teacher and a half-time teacher aide. Both were present each morning whereas following lunch, the teacher operated the classroom by herself for the last 45 minutes of the day.

Reinforcing System

The reinforcing system within the experimental classroom consisted of both social and nonsocial reinforcers. Subjects were able to earn points for appropriate social and academic behaviors which could later be exchanged for such tangible, backup reinforcers as model cars and airplanes, games, books, chess sets, chemistry sets, toys, and athletic equipment. A large number of backup reinforcers was provided to increase the likelihood that at least one of the reinforcing stimuli would be relevant to the deprivation conditions of the various subjects (Ferster & DeMayer, 1962).

Each child could earn a maximum of 35 points per day. Points were awarded on the basis of concurrent schedules (Catania, 1966). Subjects could receive points on both a variable interval schedule of reinforcement for appropriate classroom behavior and a fixed ratio schedule for correct academic responses and completion of assignments.

Points could be exchanged at 1 p.m. each day for backup reinforcers. There were six levels of point value for the available items, ranging from 25 points to 200 points with occasional special items for 500 points. The values for these reinforcers approximated their purchase price, e.g., 25 points were required for toys costing 20¢ to 39¢; 50 points for toys costing 40¢ to 65¢, etc., and so forth.

The least expensive reinforcing stimuli could be earned for high rate task-oriented behavior within a single day. The subjects were free to exchange their points for an inexpensive item or accumulate them for a more expensive one. There was no evidence of any subject's inability to delay gratification and save points for more expensive items. The academic productivity of the children during each phase remained relatively constant whether receiving immediate exchange for backup reinforcers or delaying exchange to purchase more costly items.

Apparatus

An electronic display board (Walker, Mattson, & Buckley, 1971) was used for recording reinforcing events and for providing subjects with discriminative stimuli for appropriate and inappropriate behaviors. The device was also used to provide a more systematic presentation and removal of points than can be achieved with teacher marks on point sheets.

Insert Figure 2 About Here

The display board contained a unit for each subject with name, stimulus light, three digit plus and three digit minus counters. A similar

unit set apart from the rest and containing a larger light was used for recording and regulating group reinforcing climates. A control panel at the side of the room allowed immediate and visible reinforcement. Each subject was required to be in his seat ready to begin the assignment before his light came on. When the stimulus light was on, it signified that the child was behaving appropriately and that he had gained access to a schedule of reinforcement. When the subject received a point, his light flashed, there was an audible click, and the cumulative counter recorded the event. If the subject was behaving inappropriately, his light was extinguished and a buzzer sounded which signaled the occurrence of deviant behavior. A predetermined number of points was then subtracted from the subject's cumulative point total. The number of points subtracted was dependent upon the extent of the deviant behavior. More deviant behaviors resulted in larger point losses and less deviant behaviors resulted in smaller point losses. No subject's points were ever taken below zero. If a subject lost all his points during the day, further deviant behaviors resulted in short periods of timeout until he earned additional points. At any time that it became necessary for a child to be placed in timeout or to be suspended from the experimental classroom his stimulus light remained off and he was not able to earn points until he returned to the classroom.

At the end of the day, plus and minus points as well as total cumulative points were tabulated for each child. The points were then transferred to a cumulative point sheet. Thus, each day the subjects began with zero points on the display board. In this way, each child was able to easily identify his daily achievement.

Instructional Program

Three major tasks were accomplished during the first week in the experimental classroom. These were (1) orientation to the physical aspects of the classroom, (2) orientation to classroom rules and procedures, and (3) diagnostic testing of reading and arithmetic skills. Orientation to the classroom consisted of taking the child on a tour of the facility, including the observation room (with one-way mirror), and the timeout room. The area containing backup reinforcers was shown only prior to a token economy phase. Orientation to classroom rules and procedures consisted of a teacher-led discussion of the classroom time schedule for activities including recess, P.E., lunch period, etc., and details concerning the use of red tags (for asking questions) and daily assignment sheets. When points were introduced, further discussions were held on how they were earned and which behaviors resulted in cost contingency.

Diagnostic Testing. The purpose of testing was to determine where the subjects stood academically. Acting-out children frequently display high rates on behaviors that compete with academic performance (Mattos, Mattson, Walker, & Buckley, 1969; Walker, 1971). As a result, they often have deficits in the basic skills areas of reading and arithmetic. The diagnostic testing provided a basis for individualizing instruction for each subject as well as a measure of academic gains during treatment.

Two tests were used for the diagnostic assessment of reading and arithmetic skills: (1) Gates-McKillop Reading Diagnostic Tests, form I and II and (2) Stanford Diagnostic Arithmetic Test, form X and W, level I or II. The Gates-McKillop Tests were chosen because they allow a functional assessment for instructional purposes due to the range of skills

tested. They also provide standardized indices of performance expressed in grade equivalent scores. The form of the test, I or II, used for the first testing situation was arbitrary as long as the alternate form was administered as a post-test at the end of treatment.

The Stanford-Diagnostic Arithmetic Test was selected for the same reasons as the Gates-McKillop, i.e., to provide a basis for individualizing remedial instruction and for measuring academic gains during treatment. The blending of modern math and more traditional problem types in the Stanford Diagnostic Test also made it more appropriate for a group of subjects with varied instructional backgrounds. Instruction in the experimental classroom more closely resembled traditional math instruction in the basic skills areas. The computational part of the test was given on the first day with each subject working at his desk with a timer set by the teacher for the required time interval. The concepts portion of the test and testing skills in counting, numerical operations and place value were given orally to the whole group. Level I was used most often because the subjects tended to be functioning well below grade level. In those cases where level II was warranted, it was given after level I and by necessity on an individual basis. The alternate form of the test given the first week of the program was administered at the end of treatment, making it possible to measure gains in academic achievement.

Academic Materials. Each child, at the beginning of treatment, was given work that he could perform fairly independently and well below frustration level in most subject areas. As treatment progressed and the requisite skills were acquired, academic assignments were gradually made more difficult.

Academic materials used in the classroom were designed to meet the individual instructional requirements of each child. Materials used include programmed texts, books from the subjects' regular classrooms, and teacher-prepared materials. Selection of programmed materials was based on evaluations of materials conducted during the previous academic year. Programmed materials used were: (1) Sullivan Associates Programmed Reading Series (McGraw-Hill), (2) Classroom Reading Clinic (Webster Co.), (3) Geography of the U.S. (Programmed, McGraw and Williams), (4) Lessons in Self-Instruction in Basic Skills (California Test Bureau), and (5) T.M.I. Grolier Program (Teaching Machines, Inc.). Regular educational and remedial materials used included: (1) Conquests in Reading (Kottmeyer and Ware, McGraw-Hill), (2) Dr. Spello (Kottmeyer and Ware, McGraw-Hill), (3) Science Research Associates, Reading Series and Math Series, and (4) Continental Press mimeographed materials. Subjects also received remedial instruction from the Hegge, Kirk and Kirk drills.

Observation and Recording

Graduate and undergraduate students in education and psychology, interested in working with handicapped children, served as observers throughout the various phases of this study. A total of 10 observers plus a calibrating observer were used during the academic year. During each term of the academic year, three different observers were selected.

At the start of observer training, each new observer was given a copy of the observation form and manual (for acting-out children) to read and master (Walker, 1971). Once the observing instructions and code definitions were memorized to the satisfaction of the observer, he was brought

into the observation facilities to practice taking observations. Each new observer worked with the observer trainer during a trial period. A video tape of a previous group of subjects also was used in the training process. The training observer and the new observer took simultaneous recordings to check reliability during these training sessions.

The subjects' classroom behaviors were recorded every 15 seconds during a 6-minute observation period. To determine the passage of time, interval timers were mounted in clipboards. At the end of each 15-second period, a "bleep" was heard in the earphone and a light mounted in the clipboard flashed. This signal led the observer to record the behaviors and move to the next interval on the observation form. During each 15-second interval, the observer recorded both the behavior of the subject and the social consequences of his behavior. Observers were free to code more than one subject behavior and more than one consequence during each 15-second interval. A description of the behavior categories and agent responses is presented in Appendix A.[1]

Observations of the subjects were taken in the regular classroom prior to enrollment in the experimental classroom, during treatment, and following treatment back in the regular classroom. Baseline data for each subject consisted of a minimum of 120 minutes of observation in the regular classroom over a 2-week period. Observers were instructed to remain as inconspicuous as possible and not interact with experimental subjects in any way. Daily observations were recorded during treatment and weekly observations were recorded during follow-up.

Reliability

Reliabilities were calculated by scoring each interval for the number of agreements between pairs of observers. The total number of agreements was divided by the total number of behaviors recorded (agreements plus disagreements) to obtain the reliability coefficient. For an agreement to be scored in any one interval, observers were required to agree on the behavior being coded as well as the type of agent response that followed the behavior.

Reliability criterion for an observer was five consecutive, six-minute observations with reliability coefficients of .90 or above. The training process required approximately one week with one-hour sessions per day. Generally, new observers spent two days practicing observations and three checking reliabilities with the trainer. It was found that weekly spot checks on reliability were required to maintain inter-observer agreement. This was necessary because the behavior of the children changed over time and with it the requirements of the observer changed.

Average inter-observer reliabilities, by individual observer and by behavior category, are presented below.

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Insert Table 1 About Here
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The mean reliabilities for individual observers ranged from 73 percent to 92 percent. Average reliabilities by behavior category ranged from 65 percent (inappropriate PH) to 100 percent (appropriate PH). However, these two behavior categories were recorded an average of only 1.1 and .6 times per observer. Reliabilities for these two categories were thus based upon a small number of frequencies. If the frequencies of these two categories

had been higher, their reliability coefficients may have been considerably different.

Reliabilities for individual observers maintained satisfactorily following the training sessions. Mean reliabilities during the weekly spot checks ranged from 90 percent (observer 10) to 97 percent (observer 8) and averaged 93 percent across observers.

Experiment I
Functional Analysis of
Treatment Model Components

The design of this experiment allowed for a systematic introduction and evaluation of one treatment variable at a time. Individual treatments were introduced and withdrawn as necessary to establish their functional relationships (or a lack of them) with behavioral outcomes.

Variables were added cumulatively. After the first variable was introduced and evaluated, subsequent variables were added to the first until a total treatment model was developed that was effective in modifying deviant classroom behavior.

Procedures

Experiment I consisted of 10 phases during a period of approximately four and a half months. The 10 phases were as follows: (1) $baseline_1$ (regular classroom), (2) $baseline_2$ (experimental classroom), (3) social, (4) social plus tokens, (5) social, (6) social plus tokens, (7) social plus tokens plus cost contingency, (8) social plus tokens, (9) social plus tokens plus cost contingency, (10) social plus cost contingency plus fading tokens. Phases two, six, and nine lasted one week (five school days);

Baseline$_1$. Observation data were taken on all subjects in their regular classrooms. Prior to entering the experimental classroom, 20 6-minute observations were collected on each subject over a 2-week baseline period in his regular classroom. Parents were asked not to inform the child he had been selected for the experimental classroom until after the 2-week baseline period was over.

Baseline$_2$. A second, 1-week baseline period was programmed in the experimental classroom. The purpose of this phase was to test for behavior change(s) associated with a new setting, new materials, and new teachers. However, an attempt was made to replicate the quality and quantity of teacher attention each child received in his regular classroom. Therefore, the density per hour of teacher praise for appropriate behavior and teacher disapproval for inappropriate behavior that was dispensed by the regular classroom teacher was calculated from data collected during baseline$_1$. The praise and disapproval rates computed for each subject were prorated for the 4-hour day of the experimental classroom. Actual and prorated rates are presented in Table 2.

Insert Table 2 About Here

Teachers in the experimental classroom dispensed the praise and disapproval events uniformly over a 4-hour day.

No attempt was made to equate total teacher attention to the subjects in their regular classrooms with total teacher attention received in the experimental classroom. This would have been impossible since the teacher-pupil ratio was 1:2.5 in the experimental classroom and 1:24 in the regular classroom. No token reinforcement procedures or special consequences were

Social. In this phase, each subject received 30 social reinforcements per day for appropriate behavior. Teachers were instructed to select 30 discrete behavioral events to reinforce each day. Due to the low rate of appropriate behavior occurring at this point in treatment, the teachers were sometimes required to reinforce approximations to appropriate behavior. To insure that the social reinforcers were distributed evenly, the class day was divided into four 1-hour periods and each subject received 7.5 social reinforcements per hour. All teacher attention to inappropriate behavior was withdrawn during this period.

Social Plus Tokens. Token reinforcement was introduced during this phase. Subjects could earn a maximum of 35 points and a minimum of 20 points per day. The 15-point range was set up in order to make possible differential reinforcement of high and low quality performance. All subjects continued receiving 30 social reinforcements per day. Each time a token was delivered, it was paired with a social reinforcer. The social reinforcer was delivered first and followed immediately by a token. However, not all social reinforcements were paired with tokens. For example, a subject who earned only 25 points on a given day would have 83 percent rather than 100 percent of his social reinforcements paired with tokens.

Social. Conditions in this phase were identical to those during phase three.

Social Plus Tokens. Conditions in this phase were identical to those during phase four.

Social Plus Tokens Plus Cost Contingency. Cost contingency, the subtraction of earned reinforcers contingent upon deviant behavior, was introduced during this phase. Fig. 3 contains the deviant behaviors, with corresponding point losses, to which cost contingency was applied.

Insert Figure 3 About Here

Point losses ranged from one to four points; the more deviant behaviors resulting in larger losses. Less deviant behaviors such as talking out and nonattending were relatively less costly.

The squares beside each behavior in Fig. 3 represent days of the week. This form was used to administer cost during each session. When a deviant behavior was emitted, the teacher walked over to the child's desk and placed a dot in the square beside the indicated behavior. She then extinguished the child's stimulus light on the display board and subtracted the corresponding number of points. Thus, each time cost contingency was used, the child knew the behavior to which it was applied as well as the number of points lost.

Prior to implementing cost, the teacher led a discussion about the deviant behaviors to which cost contingency would be applied. This was to insure that each child understood the technique and the way it would be used. Cost was applied every time one of the deviant behaviors occurred.

Social Plus Tokens. Conditions in this phase were identical to those during phase six.

Social Plus Tokens Plus Cost Contingency. Conditions in this phase were identical to those during phase seven.

Social Plus Cost Contingency Plus Fading Tokens. Conditions in this phase were identical to those in phase nine, except the number of possible points that could be earned per day was reduced from 35 to 11 during the 2-week period. The schedule for fading tokens is presented in Table 3.

Insert Table 3 About Here

The total possible number of points that could be earned was reduced from 35 to 24 points during the first 3 days, and further reduced to a total of 11 points which could be earned during the last 2 days of the fading period.

Tokens were faded so as to prepare the subjects for reintegration into their regular classrooms. No announcement was made that tokens were being faded, but all subjects continued receiving 30 social reinforcements per day during this phase. Cost contingency was also applied whenever deviant behavior occurred.

The teachers were required to record their own behavior in implementing the various phases of Experiment I. This procedure helped them monitor their own performance and insured that the experimental conditions were carried out as described. For example, they were instructed to distribute the 30 social reinforcements equally over the four 1-hour periods during each day. Every time the teacher delivered a social reinforcement, she recorded the event on a form on the child's desk. Thus, she was able to see how many social reinforcements had been delivered during each time period. This prevented both excesses and deficits. The teachers' administration of cost contingency and token reinforcement was also monitored closely by the experimenters.

Results

Results of the functional analysis of components within the treatment model are presented in Fig. 4.

Insert Figure 4 About Here

Individual data points in Fig. 4 represent the mean percent of appropriate behavior produced by each of the subjects during the various phases. Each data point is a composite of the six categories of appropriate behavior in the observation form. Data points are based upon a minimum of 20, 6-minute observations per subject per phase.

The five subjects averaged 34 percent appropriate behavior during $baseline_1$. The range among the five subjects was 15 percentage points with a low mean of 24 percent appropriate behavior for $\underline{S}_2$ and a high mean of 39 percent for $\underline{S}_3$. The standard deviation for the five data points was 6.05 percent. During $baseline_2$ the mean percent of appropriate behavior for the five subjects increased from 34 percent to 47 percent. The mean percent for every subject was higher during $baseline_2$ than $baseline_1$. The standard deviation of the data points during $baseline_2$ was 5.95 percent.

The intra-subject variability from one 6-minute observation to another was considerable, for all subjects, during $baseline_1$ and $baseline_2$.

Insert Table 4 About Here

Table 4 contains the ranges of appropriate behavior for each subject during $baseline_1$ and $baseline_2$. The ranges for each subject increased substantially during $baseline_2$. This was due primarily to an increase in the upper level of appropriate behavior for each subject. For example, the highest scores for each of the five subjects averaged 72 percent during $baseline_1$ and 97 percent during $baseline_2$. The lowest scores averaged 7 percent and 5 percent respectively during $baseline_1$ and $baseline_2$.

The session to session variability, as measured by individual standard deviations, also increased for the subjects during $baseline_2$.

Insert Table 5 About Here

Table 5 contains standard deviations for each subject during $baseline_1$ and $baseline_2$. The standard deviations ranged from 15.22 percent to 25 30 percent during $baseline_1$ and from 21.56 percent to 26.07 percent during $baseline_2$. The mean difference between the two sets of standard deviations was statistically significant ($t = 3.17$, $df = 4$, $p < .05$). Thus, the effect of the change in setting during $baseline_2$ was to increase the level as well as the variability of each subject's appropriate behavior.

During phase three, there was a substantial increase in appropriate behavior for four of the five subjects following the increase in social reinforcements, the group mean increasing 13 percentage points from $baseline_2$. However, S_2's average amount of appropriate behavior was actually lower under social than in $baseline_2$.

The standard deviation for the five subjects was 9.84 percent under social; an increase from 5.95 percent in $baseline_2$. The greater inter-subject variability under social is due largely to the performance of S_2.

When tokens were introduced in phase four, there was a mean increase of 19 percentage points in appropriate behavior for the group, with all five subjects showing a substantial gain. There was no overlap among the two sets of data points. The standard deviation under tokens was very similar to the standard deviations for $baseline_1$ and $baseline_2$.

When tokens were withdrawn in phase five, the group showed a mean decrease in appropriate behavior from 79 percent to 67 percent. The decrease occurred in the performance of all five subjects, S_1 and S_3 returning to their previous levels in phase three (social). However, the averages for

$\underline{S}_2$, $\underline{S}_4$, and $\underline{S}_5$ remained well above their corresponding averages in phase three. The inter-subject variability in phase five was less than half that in phase three, due primarily to the performance of $\underline{S}_2$.

When tokens were reintroduced in phase six, the group mean returned to 79 percent. The amount of appropriate behavior increased for all subjects during this phase. The standard deviation was 5.70 slightly less than the standard deviation of 6.05 for the previous token period in phase four.

Cost contingency was introduced in phase seven and the effect was consistent for all five subjects. There was a mean increase of 17 percentage points, from 79 percent in the previous phase to 96 percent in the present one. The inter-subject variability was reduced considerably with the introduction of cost. The standard deviation decreased from 5.70 in phase six to 1.93 in phase seven.

With the removal of cost contingency in phase eight, there was a decrease in the average amount of appropriate behavior from 96 percent to 80 percent. Moreover, the inter-subject variability increased from 1.93 percent to 5.73 percent. Both the means and standard deviations of phase eight and phase six (the previous social plus tokens period) were nearly identical.

Cost contingency was reintorduced in phase nine. The group mean increased from 80 percent to 95 percent and the standard deviation decreased from 5.73 to 1.87 percent. Thus, the reintroduction of cost replicated the results produced in phase seven.

Fading points in phase ten had no effect upon the average amount of appropriate behavior produced by the five subjects. The group means in phases nine and ten were identical. However, the inter-subject variability

showed an upward movement, the standard deviation increasing to 2.79 percent during this phase.

Frequency and Distribution of Cost Contingency Applications

Cost was applied to the designated behaviors every time they occurred. Each time, the teacher recorded the behavior to which cost was applied and the resulting point loss. Thus it was possible to study the effects of cost in suppressing each of the eight deviant behaviors across subjects.

Insert Table 6 About Here

Table 6 contains the frequencies with which cost was applied by behavior and by subject during Session I (phase seven). This ranged from an average of nearly eight times per day for S_1 and S_5 to a little over once per day for S_4.

The low frequency behaviors during Session I were fighting (2), swearing (0), out of seat (5), and teacher defiance (8). The high frequency behaviors were talk-outs (68), nonattending (32), disrupting or disturbing others (23), and playin with objects (29).

Table 7 contains the frequencies for the application of cost in Session II (phase nine).

Insert Table 7 About Here

The mean frequencies with which cost was applied to the behavior of individual subjects in Session II are very consistent with the frequencies in Session I even though they decreased for four of the five subjects. Except for S_1 and S_5 reversing their positions in Session II, the rank order of the subjects remained the same.

To demonstrate the cumulative effect of the procedure, the cost contingency frequencies for successive days of Session I are presented in Table 8.

Insert Table 8 About Here

Across all subjects, cost was used 38 times the first day it was introduced, 19 on the second day, 33 on the third, and then showed a gradual decrease from the fourth to the last day of Session I. The frequencies indicate cost initially had an abrupt suppression effect (day two) upon the deviant behaviors to which they were applied. This was followed by an initial recovery and then a more gradual suppression in frequency during the remainder of the phase.

Changes in Academic Performance

Pre- and post-achievement tests were given to measure academic gains during treatment. Changes in math achievement, as measured by the Stanford Diagnostic Arithmetic Test, are presented in Table 9.

Insert Table 9 About Here

Gains in arithmetic concepts ranged from 7 months to 2 years and 6 months with a mean of 1 year, 7 months. In arithmetic computation, the increases ranged from 1 year, 2 months to 1 year, 6 months with a mean of 1 year, 4 months.

S_3 and S_5's pre-test scores were below grade level 1.5 on arithmetic concepts. However, the Stanford does not report grade equivalent scores below this level. Thus, a score of 1.5 may not reflect the true initial performance of these two subjects.

Insert Table 10 About Here

Table 10 contains gain scores on the Gates-McKillop Reading Diagnostic Test. Gains for the five subjects ranged from 1 month to 1 year, 3 months with an average gain of 6 months.

Discussion

The primary purpose of Experiment I was to design a treatment model that would be effective in modifying deviant classroom behavior. Another objective of the experiment was to provide data on the differential effects or weight of each component within the model in producing behavior change. The data in Fig. 4 indicate that social approval, tokens, and cost contingency are powerful treatment variables in the modification of deviant behavior. These data also indicate that a substantial treatment effect was associated with a change in classroom setting, teachers, and instructional materials.

Token economy studies by Walker, Mattson, and Buckley (1971), Hewett (1968), and O'Leary and Becker (1967) have produced substantial changes in behavior within the special class setting. However, the $baseline_2$ results of the present study suggest that part of the overall treatment effect in such studies may be due to a simple change in setting. Novel stimuli associated with the special class setting include reduced teacher-student ratios, new instructional materials, individualized instruction, and increased teacher attention. These stimuli appear to represent a powerful treatment variable. The average amount of appropriate behavior increased 13 percentage points for the five subjects from $baseline_1$ to $baseline_2$. This equals the increase in appropriate behavior produced by manipulation

of social reinforcement in phase three. Thus, it appears a portion of the treatment effect usually attributed to the token economy may be due instead to the operation of novel stimuli specific to the treatment setting.

The manipulation of social reinforcement in phase three increased appropriate behavior for four of the five subjects. This result replicates many other studies of the effect of increased teacher attention to appropriate classroom behavior (Hall & Broden, 1967; Hall, Panyan, Rabon, & Broden, 1968; Madsen, Becker, & Thomas, 1968).

However, the performance of $\underline{S}_2$ under social indicates that positive teacher attention does not automatically function as a reinforcer for all children. The average amount of appropriate behavior for $\underline{S}_2$ was actually lower under social than it was during baseline$_2$. His nonresponsiveness to social reinforcement from the teacher may have been due to aversive interactions with his previous teachers. However, the authors have no data to support this hypothesis.

Token reinforcement proved to be an effective variable in increasing the appropriate behavior of all five subjects. Tokens produced the greatest gains for $\underline{S}_2$ and $\underline{S}_4$ and the smallest gains for $\underline{S}_3$ and $\underline{S}_5$. The intersubject variability was smaller under tokens than under social. However, the reduced variability was due almost exclusively to the performance of $\underline{S}_2$.

The performance of $\underline{S}_2$ in phases four (tokens) and five (social) indicates that social reinforcement from the teacher acquired reinforcing properties after having been consistently paired with token reinforcement. A substantial increase in his appropriate behavior occurred when tokens were introduced. With a return to social in phase five, his average amount of appropriate behavior remained well above his average in phase three.

After being paired with tokens, social reinforcement produced a much more reliable treatment effect across the five subjects. The inter-subject variability was reduced by more than half from the previous social reinforcement phase. Moreover, it was below the variability in phase four during which social had been paired with tokens.

The results of phase five indicate that the reinforcing properties of teacher attention can be increased through pairing with token reinforcement. Thus, it appears this technique can be used to improve the effectiveness of teacher attention as a behavior modification technique. In addition, the pairing also seems to make teacher attention more consistently effective across children.

The introduction of cost contingency also proved to be an effective variable for increasing appropriate behavior. This technique produced the most consistent effect across subjects. The inter-subject variability in phases seven, nine, and ten, when cost was in effect, was lower than at any other time during Experiment I.

The fading procedure in phase ten did not affect the average amount of appropriate behavior produced by the five subjects. However, there was an increase in inter-subject variability. This effect is consistent with previous studies which have reported increases in behavioral variability following the withdrawal of token reinforcement procedures and reintegration of subjects into the regular classroom (Walker & Buckley, 1968; Walker, Mattson, & Buckley, 1971; and Walker & Buckley, in press). However, a minor increase in variability seems negligible when compared with the potential advantages that can accrue from fading tokens. This procedure can make the transition from special to regular class placement smoother as well as facilitate behavior maintenance following treatment.

Overall, a treatment model consisting of social, tokens, and cost contingency appears to be very effective in modifying deviant classroom behavior. Token reinforcement, however, produced the greatest increase in appropriate behavior in this experiment. Cost contingency was the next most effective treatment variable followed by social and change of settings. However, using the degree of variability among subjects as a measure of treatment effectiveness, cost contingency is the more powerful of the three variables producing the most consistent and least variable behavior across all subjects.

The combination of social, tokens, and cost contingency proved to be more effective than social plus tokens or social alone. This is consistent with the results of a prior study by Walker, et al. (1971) in which a combination of tokens, social, and timeout, was found to be more effective than either social plus tokens, tokens plus timeout, or social plus timeout.

In the Walker, et al. study, social, tokens, and timeout were applied in combination for a 5-week period. Each variable was then systematically withdrawn and reintroduced to measure its effect in controlling behavior at that point in the experiment. The withdrawal of social produced the greatest disruption in behavior; resulting in a decrease in the mean percent of appropriate behavior as well as a substantial increase in both inter- and intra-subject variability. The effect was consistent for all five subjects in the study.

Withdrawing timeout produced the next greatest disruption in behavior. However, the behavior of one subject was completely unaffected by the removal of timeout.

When tokens were withdrawn, a major disruption occurred in the behavior of only one subject with a slight disruption in the behavior of another.

The remaining three subjects were unaffected by the removal of tokens. Thus, after 5 weeks of treatment, tokens appeared to exercise little control over the subjects' appropriate behavior. Their appropriate behavior appeared to be largely under the control of social reinforcement and time-out at this point in the experiment. This suggests that token reinforcement may be a more important variable in the early stages of treatment. However, it is likely that it can be faded out rather quickly and behavioral control shifted to more natural reinforcers such as teacher attention. This may be especially true if tokens and social are systematically paired before token reinforcement is permanently removed.

In the present study, both tokens and cost contingency produced reliable increases in appropriate behavior for all subjects, whereas social was effective for only four of the five. However, after being paired with tokens, the power of social reinforcement was substantially increased.

The effectiveness of cost contingency in reducing deviant classroom behavior is reflected in the observation data (see Fig. 4) and in the data on application of cost to the behavior of individual subjects (see Tables 6 and 7). Whenever cost was introduced, the overall percentage of deviant behavior was reduced. Conversely, the overall percentage increased whenever it was removed. The frequency with which cost had to be applied to deviant behavior gradually declined over successive days of each session (see Table 8). Cost was effective in reducing the frequency of each of the individual deviant behaviors to which it was applied.

Although cost contingency produced a treatment effect for each of the five subjects in the experiment, the average frequency with which it was applied per day varied considerably across subjects. For $\underline{S}_1$ and $\underline{S}_5$, for

example, cost had to be applied an average of nearly eight times per day during Session I, whereas for $\underline{S}_4$ only slightly more than once per day was required during the same period. Between the two extremes, $\underline{S}_1$ and $\underline{S}_3$ required cost an average of four and a half and three times per day, respectively.

It is clear that differing amounts of punishment were required in order to suppress the deviant behavior of each subject. However, the reasons for this are not at all clear. It could have been that the deviant behaviors of $\underline{S}_1$ and $\underline{S}_5$ were at very high strength (and thus initially resistant to mild punishment procedures) due to a prior history of intermittent reinforcement. Another possible explanation could be that $\underline{S}_2$, $\underline{S}_3$, and $\underline{S}_4$ learned to suppress their deviant behavior in the presence of cost primarily through vicarious means whereas $\underline{S}_1$ and $\underline{S}_5$ did not. That is, observing punishment administered to others contributed to the suppression of deviant behavior in these subjects. A third alternative could be that the arbitrarily assigned point losses were aversive enough to suppress the deviant behavior of $\underline{S}_2$, $\underline{S}_3$, and $\underline{S}_4$. However, they may not have been sufficiently aversive for $\underline{S}_1$ and $\underline{S}_5$. If the deviant behaviors served as high probability events for these two subjects, then it may have been worth the resulting point losses in order to engage in them. Answers to these and related hypotheses will have to await further research on the parameters of cost contingency in suppressing deviant classroom behavior.

Gains for the five subjects in math achievement during treatment averaged a year and 7 months in arithmetic concepts and a year and 4 months in arithmetic computation. Each subject was used as his own control in this experiment. Thus, pre- and post-test gains for matched, untreated

controls were not available for comparative purposes. However, it does appear that the average gain of the five subjects exceeds the rate that would be expected if the subjects had remained in their regular classrooms. Standardized tests are based on the notion that a child will average a 1-month gain in achievement for each month spent in the regular classroom. According to this criterion, the five subjects would have gain approximately 4.5 months in achievement during the treatment period. The average gain for the five subjects during treatment was more than double this rate.

The average gain of 6 months in reading achievement on the Gates is slightly above the criterion figure of 4.5 months. However, the subjects were quite variable in their reading achievement. The gains for $\underline{S}_1$, $\underline{S}_3$, and $\underline{S}_4$ were 4 months, 2 months, and 1 month, respectively, while gains for $\underline{S}_2$ and $\underline{S}_5$ were a year or more.

Thus, the average gain for the five subjects was greater in math achievement than in reading achievement although both were above the expected month for month increase. The lower mean gain and increased variability among the subjects in reading achievement may be attributable to a greater emphasis upon remedial math in the instructional program. The experimental class teacher appeared to be more skilled and better trained in remedial math instruction than in remedial reading instruction. Supplementing the experimental class teacher with a reading consultant or specialist may have resulted in increased reading gains. Thus, a more balanced program of reading and math instruction may have produced less variable gains in achievement.

In summary, the component variables analyzed in this experiment were sufficiently powerful to bring the classroom behavior of all five subjects

under control. The application of all three treatment variables in combination proved to be more powerful than either social alone or social plus tokens.

The procedure of adding variables cumulatively did not allow for the evaluation of token reinforcement or cost contingency in isolation. It was also not possible to directly compare the effects of social plus tokens with tokens plus cost contingency. Additional experiments in which such comparisons are made would further document the relative effects of these variables.

A further limitation of the present study consists of possible order effects. The order in which the variables were introduced could have had an effect in determining the outcome of this experiment. The results could have been different if token reinforcement had been introduced first, followed by cost contingency and then by social. A different order effect may have been produced if token reinforcement had been introduced first, followed by social and then by cost contingency. A replication of the present experiment as well as experiments which test for potential order effects are needed in order to precisely describe the parameters of social reinforcement, token reinforcement, and cost contingency in modifying behavior.

Experiment II
Evaluation of a Teacher Training Procedure Designed to Facilitate Post-Treatment Maintenance of Appropriate Behavior

The question of whether reinforcement procedures are effective in modifying classroom behavior has been documented in countless studies reported in the literature. However, investigators have only recently

begun to examine the question of whether treatment gains, produced by behavior modification techniques, do in fact generalize and maintain following treatment (Walker & Buckley, 1968; Baer, Wolf, & Risley, 1968; Kuypers, Becker, & O'Leary, 1968; O'Leary, Becker, Evans, & Saudargas, 1969; O'Leary & Drabman, 1971; Walker, Mattson, & Buckley, 1971; and Walker & Buckley, in press).

The available evidence indicates that the increased rates of appropriate behavior do not automatically maintain when treatment procedures are abruptly withdrawn (Walker, Mattson, & Buckley, 1971; Patterson, Shaw, & Ebner, 1969; Kuypers, Becker, & O'Leary, 1968; and Birnbrauer, Wolf, Kidder, & Tague, 1965). It appears that behavior maintenance following treatment is a necessary prerequisite before the overall success of any treatment program can be properly evaluated. If behavior change does not maintain following treatment, then the utility of the treatment process seems limited.

O'Leary and Drabman (1971) and Baer, Wolf, and Risley (1968) have both argued that generalization and maintenance are behavioral processes that should be systematically programmed rather than expected, or lamented when they do not occur. Therefore, behavior maintenance procedures should be incorporated as a part of the overall treatment strategy to insure the durability of treatment effects after intervention has been terminated.

Attempts to program maintenance following treatment may be most effective if the classroom teacher is involved directly in the maintenance procedures. A number of studies have demonstrated that the classroom teacher can be an effective agent in increasing appropriate behavior within the regular classroom (Hall, Panyan, Rabon, & Broden, 1968; Ward & Baker, 1968; Hall, Lund, & Jackson, 1968; Evans & Ozwalt, 1967; Thomas, Becker, &

Armstrong, 1968; and Wasik, Senn, Welch, & Cooper, 1969). However, teachers in these studies were carefully supervised and prompted by the investigators during periods in which they were attempting to modify classroom behavior. No long term data were reported in these studies on what happened after the treatment program was terminated and the experimenters removed their backup support and supervision and left the classroom entirely. Brown, Montgomery, and Barclay (1968) found that the child's behavior was affected by changes in the rate with which the consultant reinforced the teacher.

It would appear that classroom teachers can be trained to maintain the appropriate behavior of children, who have already received treatment, in the same way that they are trained to modify the behavior of children in their classes who have not received prior treatment. A question related to both these tasks is how to maintain the teacher's changed behavior over the long term. If the teacher does not maintain her own changed behavior consistently, it is unlikely that the child's appropriate behavior will maintain independently.

The purpose of Experiment II was to evaluate a teacher training procedure for programming maintenance of appropriate child behavior following treatment in an experimental classroom. Each child's regular teacher was trained in behavior modification techniques prior to his return to the classroom. The purpose of the training was to acquaint the teacher with principles of behavior modification so that she could reinforce and thereby maintain his appropriate classroom behavior. Special attention was also given to maintaining the teacher's behavior.

Procedures

Each child's teacher was contacted approximately 1 month prior to his return from the experimental classroom. The teacher was reminded of the need to plan a smooth reintegration of the child back into his regular classroom. Problems associated with maintaining treatment gains, achieved in the experimental classroom, were discussed as well as the importance of the teacher's role in achieving behavior maintenance.

A contract was established between each teacher and the research project which specified roles each would play in programming behavior maintenance. The contract (see Appendix B) provided for: (1) training the teacher in behavior modification techniques, (2) weekly monitoring of her performance, and (3) reinforcement consequences contingent upon her performance.

Teacher Training

The teacher agreed to read and master a semi-programmed text entitled Modifying Classroom Behavior (Buckley & Walker, 1970). The text deals with basic principles of behavior modification and the application of these principles in the modification of classroom behavior. The text is divided into the following sections: (1) How Behaviors Are Learned, (2) Why Behaviors Continue to Be Performed, (3) How Behaviors Can Be Eliminated, (4) Measuring Behavior, and (5) Application: Modifying Classroom Behavior.

Each teacher agreed to take a review test over the text and achieve a passing score of 90 percent correct. If the teacher did not achieve this criterion on the first try, she reread the text and retook the test until she did. The test consists of 24 items and is included as Appendix C.

Monitoring of Teacher Behavior

Each teacher met once a week with a project staff member who acted as a supervisor and monitored the teacher's performance. The supervisor, a resource teacher, provided the teacher with backup support, consultation, and feedback about her use of behavior modification principles. These meetings were also used to provide additional training and supervision in the application of specific behavior modification techniques.

The supervisor did not suggest specific techniques for the teacher to use in achieving behavior maintenance. It was the teacher's responsibility to select the procedures and techniques she planned to use. Once selected, the supervisor provided as much support and guidance as possible in their implementation.

An observer also met weekly with each teacher and provided a graphic record of the child's percent appropriate behavior for each observation session. These data indicated how well the child's behavior was maintaining. They also provided an indirect measure of the teacher's performance. In addition, the supervisor monitored these data carefully and discussed them with the teacher during weekly meetings.

Maintenance of Teacher Behavior

The contract provided for reinforcement of the teacher's behavior contingent upon her performance. If the teacher fulfilled the provisions of the contract, the research project paid her tuition and arranged for her to receive 6 hours of University credit under the course title Ed 505: Classroom Management Procedures.

The teacher's grade was dependent upon how well the child's behavior maintained during the follow-up period (approximately 4 months). If the

chidl maintained 85 percent or better of the average amount of appropriate behavior he produced during the entire treatment period, the teacher received an A grade. If he maintained between 85 percent and 75 percent of this figure, the teacher earned a B grade. A C grade was earned if the child maintained at 74 percent or less.

Each subject's average amount of appropriate behavior in the nine experimental class phases during Experiment I was used in computing these figures. For example, $\underline{S}_1$ averaged 72 percent appropriate behavior. during treatment in the experimental classroom. Eighty-five percent of this figure equals 61 percent. That is, for the teacher of $\underline{S}_1$ to earn an A grade, the child had to average 61 percent appropriate behavior during the 4-month follow-up period. For her to earn a B grade, the child had to average between 54 percent and 61 percent appropriate behavior during this period. A C grade was earned if the child averaged below 54 percent during follow-up.

Ratios were computed for each teacher, based upon the child's performance in the experimental classroom. These figures were discussed with the teachers who were able to use them as criteria in evaluting their own performance during follow-up.

The five subjects' percent appropriate behavior ranged from a mean of 34 percent during baseline$_1$ to a mean of 95 percent during the last 3 weeks of treatment (phases nine and 10). The criterion of subjects' percent appropriate behavior required for the teachers to earn an A grade ranged from the high 50's to the low 60's. The criterion for each teacher depended upon the average amount of appropriate behavior the subject produced while in the experimental classroom.

Prior research (Walker, Mattson, & Buckley, 1971; Walker & Buckley, in press) indicates that if no maintenance procedures are implemented following treatment in a token economy, appropriate behavior will show a considerable decline upon reintegration into the regular classroom. This may be partially due to the response cost involved in the extra effort required by the teacher to achieve maintenance. Thus, the authors attempted to construct ratios that would be reasonable in the requirements they placed upon teachers. However, it was hoped that the ratio requirements, coupled with appropriate reinforcement consequences, would be instrumental in achieving adequate behavior maintenance.

Results

Table 11 contains the means and standard deviations of percent appropriate behavior for each subject during baseline and follow-up periods.

Insert Table 11 About Here

The baseline data are based upon an average of 20 observations for each subject taken over a 2-week period prior to treatment. The follow-up data are based upon an average of 110 observations taken over a 4-month period following treatment. Observations were taken across various academic activities including math, reading, and language arts. The class activity during these periods was usually individual seat work.

The five subjects averaged 34 percent appropriate behavior during baseline; individual means ranged from 24 percent to 39 percent. During follow-up the group averaged 87 percent appropriate behavior and individual means ranged from 84 percent to 91 percent.

During baseline, the individual standard deviations ranged from 15 percent to 25 percent with a mean of 18 percent. Individual standard deviations are a measure of each subject's session-to-session variability. The standard deviations averaged 15 percent during follow-up and ranged from 8 percent to 19 percent.

A t test of the baseline and follow-up means indicated the difference was statistically significant ($t = 19.63$, $df = 4$, $p < .001$). The difference between the two sets of standard deviations did not yield a statistically significant ratio ($t = 1.21$, $df = 4$, p = n.s.). Thus, the subjects produced a significantly greater percentage of appropriate behavior over a 4-month follow-up period than they did during a 2-week baseline period.

While there was a significant increase in appropriate behavior from baseline to follow-up for the five subjects, there was no corresponding significant decrease in session-to-session variability. The intra-subject variability did show a considerable decrease for three of the five subjects (S_2, S_4, and S_5) from baseline to follow-up; however, for S_1 and S_3 it was actually greater during follow-up.

Each subject was observed on two separate days of each week during the follow-up period. Fig. 5 contains the average proportion of appropriate behavior produced by individual subjects during these observation periods.

Insert Figure 5 About Here

The five subjects were observed on a total of 20, 14, 21, 22, and 11 days respectively during follow-up. The variable number of days of observation per subject was due to different absentee rates and to school schedule changes and interruptions occurring during observation periods.

It can readily be seen that behavior maintenance was achieved for all five subjects during follow-up. Every teacher earned an A grade in the university class specified in the contract. The post-treatment behavior of all five subjects maintained well above the necessary levels.

With the exception of $\underline{S}_3$, the daily variability in performance was quite small during the first half of follow-up and resembled the subjects' performance in the experimental classroom. However, an abrupt increase in the variability of each subject's performance occurred approximately half way through the follow-up period. The increase was somewhat less pronounced for $\underline{S}_3$ than for the other subjects.

Table 12 contains the means and standard deviations for the first seven data points in follow-up compared with the remainign data points.

Insert Table 12 About Here

Across the entire group, the mean for the first seven data points was 91.25 and 83.98 for the remaining data points. This mean difference was statistically significant ($\underline{t}$ = 2.95, df = 4, $p > .05$). The range of standard deviations for individual subjects was 4.01 to 11.24 ($\bar{x}$ = 6.44) during the first part of follow-up, and 7.16 to 15.46 ($\bar{x}$ = 10.77) for the second half. The difference between the standard deviations was also statistically significant ($\underline{t}$ = 5.17, df = 4, $p > .01$). Thus, there was a significant decrease in the amount of appropriate behavior produced during the second half of follow-up as well as a significant increase in the variability of the subjects' daily performance during the same period. Even so, the mean percent of appropriate behavior was well above the baseline phase in every case.

The effect of the teacher training procedure was reflected in each teacher's behavior during follow-up.

Insert Table 13 About Here

Percentages of teacher attention to each subject's overall behavior during baseline and follow-up are presented in Table 13. These percentages are further broken down into teacher attention to appropriate and inappropriate behavior.

The five teachers averaged 11 percent attention to the subjects' behavior during baseline and 14 percent during follow-up. The range was 8-14 percent and 7-24 percent during baseline and follow-up, respectively. These ratios seem quite high given an average class size of one teacher to 24 children. If teacher attention were evenly distributed, given a ratio of 1:24, each child could expect to receive 4 percent of the teacher's time.

Of the 11 percent teacher attention given to the subjects during baseline in the regular classroom, approximately one-half was applied to appropriate behavior and one-half to inappropriate behavior. During follow-up the subjects averaged 14 percent attention from the teacher. Of this amount, 13 percent was applied to appropriate behavior and only 1 percent to inappropriate behavior. Each teacher showed a substantial increase in attention to appropriate behavior and a substantial decrease in attention to inappropriate behavior during follow-up.

The data summarized in Table 13 are presented graphically by observation session in Fig. 6.

Insert Figure 6 About Here

Each data point represents the percentage of teacher attention to inappropriate behavior occurring during each observation period. Data points below the horizontal axis are observations in which no attention was given to either appropriate or inappropriate behavior. Data points on the horizontal axis indicate observation periods in which teacher attention was given but none was directed to inappropriate behavior.

The teacher training procedure appeared to be most effective for the teacher of $\underline{S}_2$ and least effective for the teacher of $\underline{S}_5$ in reducing attention to inappropriate behavior. During the sessions in which the attention of $\underline{S}_2$'s teacher was recorded, there were 94 percent in which her attention was directly only to appropriate behavior. $\underline{S}_4$'s teacher was next (.88) followed by $\underline{S}_1$'s (.76), $\underline{S}_3$'s (.73), and $\underline{S}_5$'s (.50).

There was a substantial reduction in the percentage of attention to inappropriate behavior for all five teachers from baseline to follow-up. The teachers were also more consistent in withholding their attention from inappropriate behavior during this period.

Discussion

The teacher training procedure was effective in facilitating behavior maintenance for all five subjects. The high level of appropriate behavior that was maintained over the 4-month follow-up period exceeded by 53 percentage points the average percentage produced during baseline. It would have been ideal if a second group of subjects had received treatment in the experimental classroom at the same time, and then been returned to their regular classrooms following treatment with no attempt at programming

maintenance. This would have provided an additional baseline for documenting the maintenance effect. However, such a procedure was beyond the scope of the present study.

There is considerable evidence from prior studies of generalization and maintenance, following treatment in a token economy (Walker, Mattson, & Buckley, 1971; Walker & Buckley, in press) to indicate that the teacher training procedure used in this study was instrumental in achieving behavior maintenance. Walker, Mattson, and Buckley (1971) attempted to program behavior maintenance following treatment by preparing individual programs for each child's teacher to follow. The program specified academic and social consequences for appropriate and inappropriate behavior so as to adapt the special class contingencies to the individual child in the regular classroom. No supervision was provided or contracting procedures implemented for teachers of these subjects during the follow-up period. Observations were taken of each child's task-oriented behavior during a 3-month period following treatment.

The six subjects averaged 66 percent task-oriented behavior over the 3-month follow-up period, compared with 39 percent during baseline. Individual means ranged from 32 percent to 85 percent during follow-up. Thus, the maintenance procedure in this study produced a highly variable effect across subjects. This variability could be accounted for in a variety of ways. For example, it could have been due to some teachers implementing the maintenance program very carefully while others simply ignored it. On the other hand, it could have been due to variables specific to each classroom setting such as the child's peer group, different rules and structures, or different teacher expectations and instructional procedures. The

variable maintenance effect could also have been related to the respective academic skill levels of the subjects at the end of treatment.[3]

Thus, it was not possible to determine why behavior maintenance was achieved for some of the subjects and not for others. However, the maintenance effect that was achieved was well below that of the present study. Subjects in Experiment II averaged 87 percent appropriate behavior over a 4-month period compared with 66 percent over a 3-month period for subjects in the above study. Further the range among individual means for subjects in the present experiment was only 7 percentage points, from 84 percent to 91 percent. Thus, there was a much more reliable maintenance effect across subjects and across teachers in this study.

In a more extensive, 2-year study of generalization and maintenance following treatment in a token economy, Walker and Buckley (in press) evaluated three experimental strategies and one control strategy in programming maintenance. In this study, 44 subjects received 2 months of treatment in an experimental classroom. At the end of treatment, subjects were randomly assigned to one of several experimental groups or to the control group. Observations of classroom behavior were taken over a 2-month period in which the maintenance procedures were in effect.

Subjects in the control group were returned to their regular classrooms following treatment and no attempt was made to program maintenance. Subjects in this group were simply observed for a 2-month period.

Experimental group one was a peer group reprogramming strategy. In this maintenance strategy, the experimental subject's peer group was reprogrammed in order to facilitate behavior maintenance. The strategy was designed to maintain the subject's post-treatment appropriate behavior in

the regular classroom by enlisting the support and cooperation of his peer group. A group reinforcement procedure was used to accomplish this goal. When the subject returned to his regular classroom, a contingency was implemented in which he had an opportunity to earn points for appropriate social and academic behavior. When the subject earned a predetermined number of points, he exchanged them for a group reinforcement for the entire class.

Subjects in experimental group two were exposed to a strategy which was designed to facilitate maintenance by establishing as many common stimulus elements between the experimental and regular classroom settings as possible. Three sources of stimulus matching were programmed between the experimental and regular classroom settings. These were academic materials, systematic social reinforcement, and token reinforcement.

In experimental group three, each subject's regular classroom teacher was provided with training in behavior modification techniques in an attempt to facilitate generalization and maintenance of treatment effects. The purpose of this strategy was to train the classroom teacher to reinforce and support the experimental subject's appropriate behavior. Each teacher read and mastered a semi-programmed text on applications of behavior modification techniques in the regular classroom setting (Buckley & Walker, 1970). The teacher agreed to meet with the maintenance supervisor and to discuss classroom applications of the principles contained in the text. The supervisor provided the teacher with direct training in behavior modification techniques and served as a resource consultant in her application of behavioral principles in maintaining the experimental subject's behavior. After a series of initial training sessions, the supervisor visited the class on a weekly basis.

The mean percentage of appropriate behavior for subjects in the four groups were as follows: (1) peer group reprogramming: 70 percent, (2) equating stimulus conditions: 68 percent, (3) teacher training: 63 percent, (4) control: 59 percent. The means of groups one and two were significantly different from the control group mean. The subjects in the teacher training group did not significantly differ from the control group!

The teacher training maintenance strategy was much less effective than either the peer group reprogramming strategy or the equating stimulus conditions strategy in the amount of appropriate behavior produced during maintenance. This may have been due to differences among teachers within experimental group three in the motivation, skills, and/or cooperation necessary to implement the maintenance strategy effectively. Some teachers were very responsive to the training procedures and subjects in these classrooms maintained high levels of appropriate behavior. Other teachers were much less enthusiastic about the maintenance program and were less cooperative in implementing specific maintenance procedures.

Each teacher was given 3 hours of university credit, and her tuition paid, for participating in the study. However, these consequences alone were not powerful enough to maintain the behavior of all the teachers in experimental group three.

The results suggested that a number of features could be incorporated into the teacher training procedure to increase its effectiveness. These included more intensive teacher training in behavior modification techniques, closer monitoring of teacher behavior, and a contract in which contingencies between teacher performance and reinforcing consequences were specified.

Experiment II was designed to evaluate a teacher training procedure which included these additional features.

The results of Experiment II indicate that the teacher training procedure was much more effective with these additional features. Subjects in the teacher training strategy in the Walker and Buckley (in press) study averaged 63 percent appropriate behavior compared with 87 percent for subjects in the present experiment. There was also a noticeable change in each teacher's attention to appropriate and inappropriate behavior in Experiment II presumably attributable to the teacher training procedure.

The decrease in appropriate behavior and the increase in daily variability found approximately halfway through the maintenance period in the present experiment is an interesting phenomenon. When subjects are reintegrated into their regular classrooms and no attempts are made to program maintenance, there is generally a substantial decrease in appropriate behavior and an increase in behavioral variability (Walker & Buckley, in press). This phenomenon did not occur in the present study when subjects were reintegrated into their regular classrooms. Approximately halfway through the maintenance period, however, there was a decrease in appropriate behavior and an increase in behavioral variability. One possible explanation for this could be that the teachers became more lax in their application of maintenance procedures as the follow-up period progressed. However, there is no evidence for this from anecdotal data provided by the resource teacher or from observation data of the teachers' behavior. An alternative hypothesis is that peer supplied contingencies could have accounted for this effect. That is, peer reinforcement for the subjects' deviant behavior could have been competing with teacher reinforcement to appropriate behavior,

but the effect of the competing reinforcement systems may not have become evident until halfway through the maintenance period. However, it was not possible to confirm or disconfirm this hypothesis from the data gathered in Experiment II.

There are a large number of basic questions that still remain to be answered regarding the generalization and maintenance process. These questions relate to generalization of treatment effects to other settings during treatment (O'Leary, Becker, Evans, & Saudargas, 1969; and Walker, Mattson & Buckley, 1971) and following treatment (Walker & Buckley, 1968; Walker, Mattson, & Buckley, 1971; Walker & Buckley, in press; O'Leary and Drabman, 1971). Of interest as well is the possibility of a response generalization effect to other subjects by teachers trained in behavior modification techniques. If teachers are trained to use behavior modification techniques with one or two children in their classrooms, will the procedures generalize to other children in the same classroom? For example, teachers trained to ignore the deviant behavior of one child in their classrooms should ignore the deviant behavior of other children in the same room. However, there is very little data available on this question. The results of a systematic investigation of these and other related questions would have obvious implications for teacher training procedures as well as for generalization and maintenance processes.

Experiment III
Systematic Replication of a Treatment Model for Modifying Deviant Classroom Behavior

The purpose of Experiment III was to replicate the treatment model developed in Experiment I upon a second group of deviant subjects. Experiment III also made it possible to evaluate the combined effects of token reinforcement, social reinforcement, and cost contingency in modifying behavior. These variables were applied singly, and in combination, for only brief periods of time during Experiment I. No treatment condition remained in effect for more than two successive weeks. During Experiment III, it was possible to study the combined effect of these variables when applied over an entire treatment period.

Procedures

Token reinforcement, social reinforcement, and cost contingency were implemented from the first day of intervention and remained in effect throughout the treatment process. The application of these variables was identical to their application during Experiment I. Subjects could earn a maximum of 35 points and a minimum of 20 points per day. Each subject received 30 social reinforcements per day always paired with tokens as in Experiment I. Cost contingency was applied each time one of the specified deviant behaviors occurred. The instructional program was identical for subjects in Experiments I and III.

No maintenance or follow-up procedures were implemented for subjects in Experiment III because the subjects were enrolled in the experimental classroom from mid February until the end of the school year.

Results

Table 14 contains the means and standard deviations for each subject during baseline and treatment.

Insert Table 14 About Here

All five subjects showed a substantial increase in appropriate behavior during treatment. The group averaged 38.68 percent appropriate behavior during baseline and 96.20 percent during treatment. This mean gain of 57.52 percentage points was statistically significant ($t = 27.55$, $df = 4$, $p < .001$).

There was also a decrease in each subject's intra-subject variability from baseline to treatment. Standard deviations for individual subjects ranged from 11.69 percent to 20.01 percent during baseline and averaged 16.45 percent. During treatment, the standard deviations ranged from 3.97 percent to 7.00 percent with a mean of 5.95 percent. The decrease in intra-subject variability from baseline to treatment was also statistically significant ($t = 9.45$, $df = 4$, $p < .001$).

The weekly means and standard deviations for each subject during treatment are presented in Table 15.

Insert Table 15 About Here

It is readily apparent that the subjects produced very high percentages of appropriate behavior beginning with the first week of treatment. S_2 was absent during the first week. However, the remaining four subjects averaged 96.28 percent during this period.

A trend analysis was carried out to determine whether the percent of appropriate behavior increased as treatment progressed.

Insert Figure 7 About Here

As Fig. 7 graphically illustrates, a significant accelerating linear trend was found for the 11-week treatment period ($F = 13.02$, $df = 1/40$, $p < .01$). Only the means for weeks one and four vary to any extent from the slope. This trend was observed for four of the five subjects. It did not hold true for S_4. S_4's average percentage of appropriate behavior was actually higher during the first 3 weeks than it was during the last 8 weeks of treatment.

The subjects' intra-subject variability did not decrease during treatment as expected. A repeated measures ANOVA, to test for this effect, was found not to be statistically significant. Each subject's behavior was approximately as variable during the first half of treatment as it was during the second half. S_3's behavior seemed to be unusually variable during weeks three and four. However, there appeared to be no trend in the week-to-week variability of his performance.

Observation data are presented in Fig. 8 for each subject. The first 20, the middle 20, and the last 20 observations taken during treatment in the experimental classroom are compared with 20 observations taken in the regular classroom during baseline.

Insert Figure 8 About Here

An average of five 6-minute observations were collected daily on each subject for the 53 school days during treatment. Thus, it was practically impossible to graph all the data points for each subject. The data presented in Fig. 8 are representative of each subject's performance during the entire treatment period.

Fig. 8 graphically demonstrates the highly variable behavior of each subject during baseline in the regular classroom. Upon entry into the experimental classroom, there was an immediate increase in the percentage of appropriate behavior as well as a marked reduction in the variability of each subject's performance.

The level of appropriate behavior and the intra-subject variability remained relatively constant for three of the subjects across sessions I, II, and III. The performance of $\underline{S}_2$ and $\underline{S}_5$ seemed to be slightly more variable during session I than during sessions II and III. There appeared to be no difference in either the level or the variability of any of the subjects' appropriate behavior between sessions II and III.

Changes by behavior category from baseline to treatment are presented in Fig. 9 for each of the subjects and for the entire group. The behaviors of work, vocalization, physical, and movement could be coded as appropriate or as inappropriate. Normative behavior was always coded as appropriate while nonattending and noisy were always inappropriate.

Insert Figure 9 About Here

Such an analysis makes possible the evaluation of the interaction between each behavior category and treatment. Some behaviors may be more responsive to treatment in a token economy than others. Such differences are masked

when only broad categories such as percentage of study behavior, appropriate behavior, or disruptive behavior, are used to evaluate the effects of intervention. Thomas, Becker, and Armstrong (1968) reported changes in subcategories of behavior in a study of the effects of contingent teacher attention. However, O'Leary and Drabman (1971) have pointed out that such data are not currently available for token reinforcement studies.

During baseline, all five subjects had fairly high rates of nonattending, noisy, inappropriate vocalization, and inappropriate movement. Inappropriate work was a relatively low frequency category for four of the five subjects. $\underline{S}_2$, however, spent approximately one-sixth of the time in which he was observed in inappropriate work.

With the exception of normative, each of the five subjects had correspondingly low percentages in the categories of appropriate work, appropriate vocalization, appropriate physical, and appropriate movement. The baseline mean for the five subjects was 13.29 percent for normative. The next highest percentage was for appropriate work (9.89 percent) followed by appropriate movement (8.87 percent) and appropriate vocalization (4.09 percent).

Substantial increases in the categories of appropriate work and appropriate movement occurred during treatment. This held true for each of the five subjects. Appropriate vocalization also showed an increase for each subject during treatment.

Corresponding decreases occurred in the inappropriate behavior categories of nonattending and noisy during treatment. Nonattending decreased from 13.16 percent during baseline to 2.10 percent during treatment; noisy from 6.20 percent to .05 percent.

The appropriate behavior category of normative also showed a decrease during treatment. Inappropriate physical, a low rate behavior during baseline (1.00 percent), dropped out entirely during treatment. Appropriate physical was never coded during either baseline or treatment.

Frequency and Distribution of Cost Contingency Applications

Table 16 contains the frequencies with which cost contingency was applied, by behavior and by subject, for the entire treatment period.

Insert Table 16 About Here

Cost was used an average of 1.55 times per day for the five subjects. Daily averages ranged from .69 ($\underline{S}_4$) to 2.83 ($\underline{S}_3$).

Cost was applied to nonattending a total of 195 times during the treatment period. This is more than double the frequency with which it was applied to any other deviant behavior. The next most frequent behaviors respectively were talk-outs (86), playing with objects (57), disrupting or disturbing others (31), and fighting or throwing objects (20). Low frequency behaviors were swearing (3), teacher defiance (8), and out of seat (12).

The variability among subjects in the frequency with which they produced the deviant behaviors is apparent in Table 16. For example, for "out of seat" the frequency was relatively uniform whereas, for other

behavior categories such as "disrupting or disturbing others" and "playing with objects," the frequencies were highly variable among the same subjects. It appears that considerable variability existed in the frequencies with which cost contingency was applied across subjects and across behavior categories.

Changes in Academic Performance

The gain scores in arithmetic concepts and arithmetic computation as measured by the Stanford Diagnostic Arithmetic Test are presented in Table 17.

Insert Table 17 About Here

Gains in concepts ranged from 4 months to 1 year and 6 months and averaged a year and 1 month. Gains in computation averaged a year and 2 months and ranged from 9 months to 1 year and 5 months.

Gain scores on the Gates-McKillop Reading Diagnostic Test are presented in Table 18.

Insert Table 18 About Here

Gains in reading averaged 4 months and ranged from 2 months to 7 months. It was not possible to assess gains for S_1 and S_3 since their performance was below grade level 1.5 on the pre-test.

Discussion

The treatment model consisting of token reinforcement, social reinforcement and cost contingency produced a very powerful treatment effect in

Experiment III. The combined application of these variables over the entire treatment period was instrumental in achieving a dramatic and highly reliable change in behavior for all subjects.

The simultaneous application of tokens, social, and cost produced an immediate rather than a gradual change in behavior. The data in Fig. 8 indicate that each subject substantially increased his rate of appropriate behavior from the first day of treatment to a level which was maintained throughout the treatment period.

The present experiment replicates the findings of phases seven and nine in Experiment I during which the combined effect of tokens, social, and cost produced the highest levels of appropriate behavior and lowest inter- and intra-subject variability. Very similar results were also obtained in prior studies by Walker, Mattson, and Buckley (1971), and Buckley, Walker, Bridges, and Hendy (1970).

The effect of the treatment model was also replicated across behavior categories. All categories of inappropriate behavior showed a decrease from baseline to treatment. All appropriate behavior categories, with the exception of normative, showed a corresponding increase.

The normative behavior category was coded whenever subjects engaged in group or transitional activities. Examples of these activities would include moving chairs to form reading groups, listening to the teacher's instructions, and engaging in group discussions. Due to the individualized nature of instruction in the experimental classroom, there was much less opportunity for group or transitional activities than there was in each subject's regular classroom. This probably accounts for the reduced percentage of time spent in this behavior category during treatment.

Appropriate work and appropriate movement showed the greatest increases during treatment. These increases were also in part artifacts of the instructional program. An intensitve emphasis was placed upon remediating deficits in the basic skills areas of reading, arithmetic, and language. Reinforcement procedures were used to strengthen academic performance as well as those behaviors that facilitate academic performance. A very high proportion of a child's daily activity was involvement in individual seat work with less emphasis on group discussion. Thus, appropriate work and appropriate movement were apparently much more facilitative of academic performance in the experimental classroom than were appropriate physical or appropriate vocalization.

Conversely, the categories of nonattending, noisy, inappropriate work, inappropriate vocalization, inappropriate physical, and inappropriate movement all showed decreases during treatment. Each of these behaviors is incompatible with academic performance. Nonattending, noisy, and inappropriate movement perhaps compete more directly with academic performance than inappropriate vocalization and inappropriate physical. Nevertheless, the frequencies of each of these behaviors were reduced during treatment by making reinforcement available for incompatible, appropriate behaviors (appropriate work, attending, etc.) and by applying cost contingency to the inappropriate behaviors whenever they occurred.

The daily frequency with which cost was applied in Experiment III was lower, and less variable across subjects, than it was in Experiment I. The mean daily frequency was 1.55 for subjects in Experiment III compared with an average daily frequency of 4.85 (session I) and 4.12 (session II) for subjects in Experiment I. Averages for individual subjects ranged from

.69 to 2.83 in Experiment III and from 1.28 to 8.00 (session I) and 1.20 to 7.60 (session II) during Experiment I.

This result could be due to the length of time that cost was in effect for the two groups. In Experiment I, cost was in effect for a total of 5 weeks interrupted in the middle by a withdrawal of the procedure. In contrast, the cost procedure was used continuously for 3.5 months with the subjects in Experiment III. Thus cost could have had a greater suppression effect in Experiment III simply because it was applied consistently for a longer period of time.

An alternative hypothesis holds that cost, for whatever reasons, served as a more effective punishing stimulus for subjects in Experiment III. A third hypothesis suggests that the deviant behaviors of subjects in Experiment I were more resistant to punishment due to their prior conditioning histories. However, the authors have no data that would provide support for either of these latter explanations. The first hypothesis seems more likely although another experiment would be required to confirm or disconfirm this hypothesis as well.

The achievement gains for subjects in Experiment III were similar to those for subjects in Experiment I. The average gains were slightly lower for subjects in Experiment III. The mean gains for subjects in Experiment I and III were as follows: (1) arithmetic concepts - 1.72 vs. 1.12, (2) arithmetic computation - 1.42 vs. 1.20, (3) reading - .60 vs. .43. The greater gains in arithmetic achievement for subjects in Experiment I were replicated for subjects in Experiment III. This provides further support for the hypothesis that this discrepancy was related to a greater emphasis upon remedial math than upon remedial reading during treatment.

In summary, the results of Experiment III replicated many of the results obtained in Experiment I. The suppression effect associated with the application of cost contingency and changes in academic achievement were very consistent for the two groups of subjects. The combined application of tokens, social, and cost in Experiments I and III indicate that these variables were very effective in reducing deviant behavior and in accelerating appropriate behavior.

General Discussion

The data suggest that the treatment model developed in this study was very effective in modifying deviant classroom behavior. The model was designed to be sufficiently powerful in modifying the most deviant behavior that is likely to be encountered within the classroom setting.

The combination of reinforcement for appropriate behavior and mild punishment for inappropriate behavior seemed to be more powerful than either one in isolation. This is consistent with prior studies by Holz, Azrin, and Ayllon (1963), Bostow and Bailey (1969), and Walker, Mattson, and Buckley (1971) which suggest that a combination of reinforcing and aversive consequences is more effective than either one alone.

It appears that the simultaneous application of positive and aversive consequences produces a more rapid change in behavior. For instance, the application of reinforcement alone strengthens appropriate behavior but has only a minimal effect upon deviant behaviors that still are free to occur. As appropriate behavior is increased, incompatible deviant behavior will show a corresponding decrease since there are fewer opportunities for its

occurrence. If reinforcement is powerful enough, the deviant behavior should eventually extinguish. However, this can be a very slow process, especially when one is attempting to modify high rate deviant behavior.

The use of punishment alone weakens deviant behavior but may have little effect upon appropriate behavior. However, the disadvantages of using punishment alone are well documented. In addition, research evidence indicates that punishment must be severe in order to be maximally effective (Azrin and Holz, 1966).

Thus, the combination of reinforcing appropriate behavior and applying mild punishment to inappropriate behavior should result in a more rapid change in behavior. In this case, both appropriate and inappropriate behavior are being consequated simultaneously. As a result, appropriate behavior is strengthened at the same time that inappropriate behavior is weakened. This can produce a behavioral contrast effect (Reynolds, 1968) which can act to further facilitate behavior change.

The effectiveness of mild punishment procedures can depend upon the effectiveness of the reciprocal reinforcement system used to strengthen appropriate behavior. For example, the utility of timeout is based upon the assumption that brief removal from a reinforcing climate serves as a mildly aversive stimulus. Thus, behaviors to which timeout is applied should decrease in frequency. However, if the climate from which the child is removed is not reinforcing, then the effectiveness of timeout is limited.

Similarly, cost contingency will not be effective in reducing deviant behavior unless the tokens that are subtracted have previously been established as powerful conditioned reinforcers. The effectiveness of cost contingency is directly related to the reinforcing value of the tokens.

Thus, the interaction of positive reinforcement procedures and mild punishment procedures seems crucial in determining the effectiveness of any given treatment model in modifying deviant classroom behavior. In addition, careful attention must be given to the conditions under which treatment variables are applied as well as to the relationship between such variables. For example, if one point is subtracted for a behavior such as out of seat, and the child has a total of 400 points accumulated, the effectiveness of cost will be severely limited in weakening that behavior. Therefore, the ratio of points accumulated to the frequency with which cost is used must be regulated. Otherwise, the treatment procedure will not be as effective as it could be.

It seems unlikely that a treatment model as powerful as the one developed in this study is required to modify the behavior of minimally disruptive children. Ample studies have demonstrated that teacher attention can be used to increase the appropriate behavior of such children. Work by Cobb (1971) has demonstrated that token reinforcement alone can be used to increase the study behavior of children who are low on academic survival skills, e.g., persisting, attending, listening to instructions, and following directions, etc.

When token reinforcement is used in the regular classroom, it is possible to substitute activities and events natural to the classroom setting for the tangible reinforcers normally used to back up the tokens. Axelrod (1971) and others have suggested that greater use can be made of reinforcers natural to the classroom in modifying behavior. The Premack principle in which the subject's own high frequency behaviors are used to

reinforce and maintain his low frequency behaviors can be another effective device for strengthening appropriate behavior in the regular classroom.

It would appear, however, that a more powerful treatment procedure is required to modify the behavior of children who exhibit high rates on a variety of deviant behaviors. The behavior of such children can be highly aversive to the teacher as well as peers. It can also be highly disruptive to the classroom and to the behavior of other children. High rates on such behaviors as noisy, aggressive, out of seat, nonattending, and talk-outs leave little time for academic pursuits. As a result, these children are often further handicapped by being deficient in the academic skills necessary for academic success and school achievement.

The acting out child, with all his accompanying academic disabilities, often misses out on avenues of positive reinforcement common to the educational setting. Reinforcements for appropriate academic behavior are rarely available for him. The low probability of success or praise being associated with his academic performance decreases the frequency of appropriate academic behavior in a downward spiraling process, i.e., the fewer the reinforcements, the less academic work attempted; the less work attempted, the fewer the reinforcements. In addition, the aversive properties of the acting out child's social behavior often preclude or severely limit the probability of his being positively reinforced by teachers or peers (Mattos, Mattson, Walker, & Buckley, 1969). The treatment model developed in this study was designed to modify the behavior of such children.

The question of designing effective treatment procedures becomes somewhat academic unless treatment gains can be maintained after intervention

has been terminated. Post-treatment behavior maintenance can be facilitated by techniques implemented during the treatment process as well as by reprogramming the child's post-treatment environment to reinforce and support his changed behavior. The use of self-reinforcement procedures, intermittent reinforcement schedules, and fading procedures can have a positive effect in increasing behavior maintenance following treatment. Increasing the child's academic skills can also serve to maintain appropriate social and academic behavior following treatment.

Reprogramming the child's post-treatment environment generally involves retraining social agents (teachers, peers, and parents) in order to maintain the child's appropriate behavior. The teacher training procedure described in Experiment II is one such technique for achieving this goal. The peer group reprogramming strategy is another (Walker & Buckley, in press). Simultaneous application of the two techniques would be optimal in programming behavior maintenance.

O'Leary and Drabman (1971) suggest that since so little is known about the separate effects of different maintenance procedures, that it may be advisable to use a "shotgun" approach. That is, all conceivable techniques that could facilitate maintenance should be implemented during and following treatment. Additional research on behavior maintenance should separate the more effective techniques from the less effective. Until this point is reached, however, the suggestion of O'Leary and Drabman appears to have considerable utility.

The treatment model, in its present form, appears to be suitable for use in resource classrooms, special classrooms, or demonstration and experimental classrooms. To be maximally effective, the treatment variables

should be carefully implemented and monitored on a regular basis. This would not be difficult for special class teachers who have small numbers of handicapped children in their classrooms. These teachers often have backup support from school psychologists, counselors, or special education supervisors in addition to teacher aides. The additional support would make the model that much easier to implement successfully.

The generality and utility of the treatment model for use in regular classrooms remains to be tested. Utilization and effectiveness studies of the model are being carried out in a series of regular classrooms at the present time. Results of these studies should indicate which modifications are required to adapt the treatment procedures for use in this setting.

Teachers have used social reinforcement, token reinforcement, and, to a lesser extent, timeout procedures in the regular classroom. Cost contingency has rarely been used in either regular or special class settings. Normally, only one of these variables has been used at a time. As mentioned earlier, the combination of reinforcement and mild punishment procedures seems necessary to effectively modify the behavior of acting-out children. Whether regular classroom teachers can be trained to successfully implement these procedures, incombination, remains to be demonstrated.

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Footnotes

1 A copy of the complete observation manual can be obtained from the authors.

2 Due to holidays, session I consisted of only 7 days.

3 In the study by Walker, Mattson, and Buckley (1971), it appeared that the behavior of the academically more skilled children (achievement relative to grade level) maintained better over time. However, with an N of five, it was not possible to document this effect.

Table 1

AVERAGE INTER-OBSERVER RELIABILITIES
BY BEHAVIOR CATEGORY AND BY OBSERVER

Behavior Category		Observers 1	2	3	4	5	6	7	8	9	10	$\bar{x}$ Number Times Recorded per Observer	$\bar{x}$ per Behavior Category
WK	Inappropriate	64	72	--	--	89	--	--	--	--	50	4.1	69
	Appropriate	97	97	99	97	98	97	97	96	92	97	223	97
NO		91	93	100	75	93	92	81	97	24	92	58	84
NA		82	95	86	58	85	92	--	93	50	59	34	78
NY		75	74	75	100	80	--	--	50	--	100	8.7	79
VO	Inappropriate	91	80	--	--	88	100	--	100	--	73	19.2	89
	Appropriate	97	94	100	97	94	90	90	97	91	95	72.1	95
PH	Inappropriate	63	67	--	--	--	--	--	--	--	--	1.1	65
	Appropriate	100	--	--	100	--	--	--	--	--	--	.6	100
MO	Inappropriate	87	92	83	95	86	64	--	82	--	78	38.4	83
	Appropriate	93	95	93	99	95	100	100	96	98	95	190.9	96
IS	Inappropriate	86	90	--	--	90	100	--	--	--	63	10.3	86
	Appropriate	98	91	100	94	94	93	94	97	84	93	82.2	94
$\bar{x}$ per Observer		86	87	92	91	90	92	92	90	73	81		

Table 2

RATE OF TEACHER PRAISE TO APPROPRIATE BEHAVIOR AND TEACHER DISAPPROVAL TO INAPPROPRIATE BEHAVIOR FOR EXPERIMENTAL SUBJECTS DURING BASELINE IN THE REGULAR CLASSROOM

Subject	Praise/Approval Events		Disapproval Events	
1	1.5 per hour	6 per day	3.5 per hour	14 per day
2	.0 per hour	.0 per day	11.5 per hour	46 per day
3	.5 per hour	2 per day	9 per hour	36 per day
4	.0 per hour	.0 per day	9 per hour	36 per day
5	1.0 per hour	4 per day	12.5 per hour	50 per day
Total	3.0 per hour	12 per day	45.5 per hour	182 per day

Table 3

SCHEDULE OF FADING TOKENS PRIOR
TO REINTEGRATING EXPERIMENTAL SUBJECTS
BACK INTO THEIR REGULAR CLASSROOMS

Week	Day	Total Possible Points Per Day
	1	24
	2	24
1	3	24
	4	19
	5	19
	1	21
	2	15
2	3	15
	4	11
	5	11

Table 4

RANGES OF APPROPRIATE BEHAVIOR FOR EACH SUBJECT DURING BASELINE$_1$ AND BASELINE$_2$

	Subject	Low Score	High Score	Range
Baseline$_1$	1	13%	65%	52%
	2	1%	73%	72%
	3	11%	63%	62%
	4	1%	79%	78%
	5	20%	83%	63%
Baseline$_2$	1	7%	100%	93%
	2	7%	95%	88%
	3	2%	94%	92%
	4	8%	100%	92%
	5	5%	98%	93%

Table 5

STANDARD DEVIATIONS FOR EXPERIMENTAL SUBJECTS DURING $BASELINE_1$ AND $BASELINE_2$

		$Baseline_1$	$Baseline_2$
Subjects	1	15.22	22.27
	2	21.32	24.73
	3	16.44	26.07
	4	25.30	25.50
	5	16.53	21.56
$\bar{x}$ Total		18.96	24.03

Table 6

FREQUENCY WITH WHICH COST CONTINGENCY
WAS APPLIED TO DEVIANT CLASSROOM
BEHAVIORS DURING INTERVENTION

Session I[a]

Behavior	Point Loss	Subjects 1	2	3	4	5	Totals
1. Talk-outs	1	23	4	11	4	26	68
2. Non-attending	1	9	10	2	2	9	32
3. Fighting or Throwing Objects	4	1	0	1	0	0	2
4. Swearing	3	0	0	0	0	0	0
5. Out of Seat	1	1	0	0	1	3	5
6. Teacher Defiance	2	4	1	3	0	0	8
7. Disrupting or Disturbing Others	1	5	6	0	0	12	23
8. Playing with Objects	1	8	11	2	2	6	29
Totals		51	32	19	9	56	167
Average per Day		7.28	4.57	3.16	1.28	8.00	

[a]Due to holidays, Session I consisted of only 7 days.

Table 7

FREQUENCY WITH WHICH COST CONTINGENCY
WAS APPLIED TO DEVIANT CLASSROOM
BEHAVIORS DURING INTERVENTION

Session II

Behavior	Point Loss	Subjects 1	2	3	4	5	Totals
1. Talk-outs	1	15	4	5	3	12	39
2. Non-attending	1	12	4	2	1	11	30
3. Fighting or Throwing Objects	4	0	2	0	0	0	2
4. Swearing	3	0	0	0	0	0	0
5. Out of Seat	1	4	2	0	1	2	9
6. Teacher Defiance	2	4	4	2	0	1	11
7. Disrupting or Disturbing Others	1	2	2	0	1	2	7
8. Playing with Objects	1	1	1	2	0	1	5
Totals		38	19	11	6	29	103
Average per Day		7.60	3.80	2.20	1.20	5.80	

Table 8

DISTRIBUTION OF COST CONTINGENCY
APPLICATIONS OVER SUCCESSIVE DAYS

Session I

	Days	1	2	3	4	5	6	7	Total
Subjects	1	11	9	8	11	6	6	0	51
	2	6	6	4	4	3	7	2	32
	3	2	2	8	3	4	0	*	19
	4	2	1	1	1	0	2	2	9
	5	17	1	12	9	7	4	6	56
	Total	38	19	33	28	20	19	10	

*Absent

Table 9

GRADE EQUIVALENT CHANGE SCORES
IN ACHIEVEMENT FOR EXPERIMENTAL
SUBJECTS DURING INTERVENTION
(STANFORD DIAGNOSTIC ARITHMETIC TEST)

	Pre-test Form X, Level I	Post-test Form W, Level I	Gain
S_1			
Concepts	1.5	3.5	2.0
Computation	1.6	3.2	1.6
S_2			
Concepts	3.0	5.6	2.6
Computation	2.7	3.9	1.2
S_3			
Concepts	1.5*	3.6	2.1
Computation	1.8	3.4	1.6
S_4			
Concepts	4.6	5.3	.7
Computation	2.7	4.2	1.5
S_5			
Concepts	1.5*	2.7	1.2
Computation	1.7	2.9	1.2
Average Gain		Concepts	1.72
		Computation	1.42

*below grade level 1.5

Table 10

GRADE EQUIVALENT CHANGE SCORES
IN ACHIEVEMENT FOR EXPERIMENTAL
SUBJECTS DURING INTERVENTION
(GATES-MCKILLOP READING DIAGNOSTIC TEST)

	Pre-test	Post-test	
	Form I	Form II	Gain
S_1	2.1	2.5	.4
S_2	2.5	3.5	1.00
S_3	1.6	1.8	.2
S_4	3.7	3.8	.1
S_5	2.2	3.5	1.30
		Average Gain	.60

Table 11

MEANS AND STANDARD DEVIATIONS
OF PERCENTAGE APPROPRIATE
BEHAVIOR FOR EXPERIMENTAL SUBJECTS
DURING BASELINE AND FOLLOW-UP

		Baseline		Follow-up	
		$\bar{x}$	s.d.	$\bar{x}$	s.d.
Subjects	1	33.90	15.22	86.35	19.25
	2	24.05	21.32	86.41	12.88
	3	39.15	16.44	84.56	19.84
	4	35.78	25.30	87.83	15.76
	5	38.23	16.53	91.66	8.63
$\bar{x}$ Total		34.22	18.96	87.36	15.27

Table 12

MEANS AND STANDARD DEVIATIONS FOR
THE FIRST SEVEN DATA POINTS IN FOLLOW-UP
COMPARED WITH THE REMAINING DATA POINTS

		First Seven Data Points		Remaining Data Points	
		$\bar{x}$	s.d.	$\bar{x}$	s.d.
Subjects	1	88.85	4.01	85.46	9.55
	2	92.14	6.93	77.85	11.78
	3	85.85	11.24	82.21	15.46
	4	96.57	4.07	84.40	9.94
	5	92.85	5.98	90.00	7.16
$\bar{x}$ Total		91.25	6.44	83.98	10.77

Table 13

PERCENTAGE OF TEACHER ATTENTION TO TOTAL BEHAVIOR, INAPPROPRIATE BEHAVIOR, AND APPROPRIATE BEHAVIOR DURING BASELINE AND FOLLOW-UP PERIODS

	Baseline			Follow-up		
	% of Total Time for Teacher Attention (Appropriate and Inappropriate)	% of Time Teacher Attends to Appropriate Behavior	% of Time Teacher Attends to Inappropriate Behavior	% of Total Time for Teacher Attention (Appropriate and Inappropriate)	% of Time Teacher Attends to Appropriate Behavior	% of Time Teacher Attends to Inappropriate Behavior
S_1	.09	.04	.05	.12	.11	.01
S_2	.13	.05	.07	.07	.067	.003
S_3	.08	.05	.03	.17	.17	.01
S_4	.12	.05	.07	.11	.10	.01
S_5	.14	.09	.05	.24	.21	.03
$\bar{x}$	.112	.056	.054	.142	.131	.013

Table 14

MEANS AND STANDARD DEVIATIONS
OF PERCENTAGE APPROPRIATE
BEHAVIOR FOR EXPERIMENTAL SUBJECTS
DURING BASELINE AND INTERVENTION

		Baseline		Intervention	
		$\bar{x}$	s.d.	$\bar{x}$	s.d.
Subjects	1	42.00	14.89	97.56	3.97
	2	45.86	17.60	96.11	6.60
	3	35.23	20.01	95.30	6.87
	4	36.90	11.69	96.83	5.31
	5	33.42	18.08	95.20	7.00
$\bar{x}$ Total		38.68	16.45	96.20	5.95

Table 15

MEANS AND STANDARD DEVIATIONS OF PERCENTAGE APPROPRIATE BEHAVIOR FOR EACH SUBJECT DURING SUCCESSIVE WEEKS OF INTERVENTION

		Subjects									
		1		2		3		4		5	
		$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.
Weeks	1	95.7	5.39	*	*	93.4	5.10	96.0	4.73	100	7.94
	2	93.5	6.98	92.5	7.47	92.9	5.90	97.4	3.74	90.7	14.00
	3	96.7	5.26	93.2	12.16	91.1	13.59	99.6	1.28	90.0	5.65
	4	99.2	1.70	98.5	1.26	95.7	11.31	96.5	4.67	95.5	6.21
	5	98.9	2.73	95.9	5.39	94.0	7.13	93.2	8.17	95.3	9.27
	6	98.0	3.16	96.5	6.41	97.3	6.85	98.4	5.91	94.5	6.27
	7	98.3	2.37	98.3	4.87	96.0	5.01	96.4	2.38	96.1	6.65
	8	98.7	2.61	95.3	7.59	95.3	5.64	96.3	8.37	95.0	5.03
	9	96.5	7.20	98.4	4.76	97.5	6.04	95.5	11.02	96.6	6.02
	10	98.8	3.18	95.3	10.72	98.0	3.76	98.8	2.54	96.2	6.32
	11	98.9	3.15	97.2	5.40	97.2	5.33	97.1	5.67	97.4	3.74
	$\bar{x}$ Total	97.56	3.97	96.11	6.60	95.30	6.87	96.83	5.31	95.20	7.00

*Absent

Table 16

FREQUENCY WITH WHICH COST CONTINGENCY
WAS APPLIED TO DEVIANT CLASSROOM
BEHAVIORS DURING INTERVENTION

Behavior	Point Loss	Subjects 1	2	3	4	5	Totals
1. Talk-outs	1	11	9	44	8	14	86
2. Non-attending	1	31	32	52	17	63	195
3. Fighting or Throwing Objects	4	1	5	4	0	10	20
4. Swearing	3	0	3	0	0	0	3
5. Out of Seat	1	2	2	4	1	3	12
6. Teacher Defiance	2	0	3	1	0	4	8
7. Disrupting or Disturbing Others	1	6	4	18	1	2	31
8. Playing with Objects	1	5	3	27	10	12	57
Totals		56	61	150	37	108	412
Average per Day		1.05	1.15	2.83	.69	2.03	

Table 17

GRADE EQUIVALENT CHANGE SCORES
IN ACHIEVEMENT FOR EXPERIMENTAL
SUBJECTS DURING INTERVENTION
(STANFORD DIAGNOSTIC ARITHMETIC TEST)

	Pre-test	Post-test	
	Form X, Level I	Form W, Level I	Gain
S_1			
Concepts	1.5*	2.3	.8
Computation	1.6	2.5	.9
S_2			
Concepts	2.7	4.2	1.5
Computation	2.4	3.8	1.4
S_3			
Concepts	1.5*	1.9	.4
Computation	2.2	3.1	.9
S_4			
Concepts	2.0	3.6	1.6
Computation	1.7	3.0	1.3
S_5			
Concepts	2.8	4.1	1.3
Computation	2.4	3.9	1.5
Average Gain		Concepts	1.12
		Computation	1.20

*below grade level 1.5

Table 18

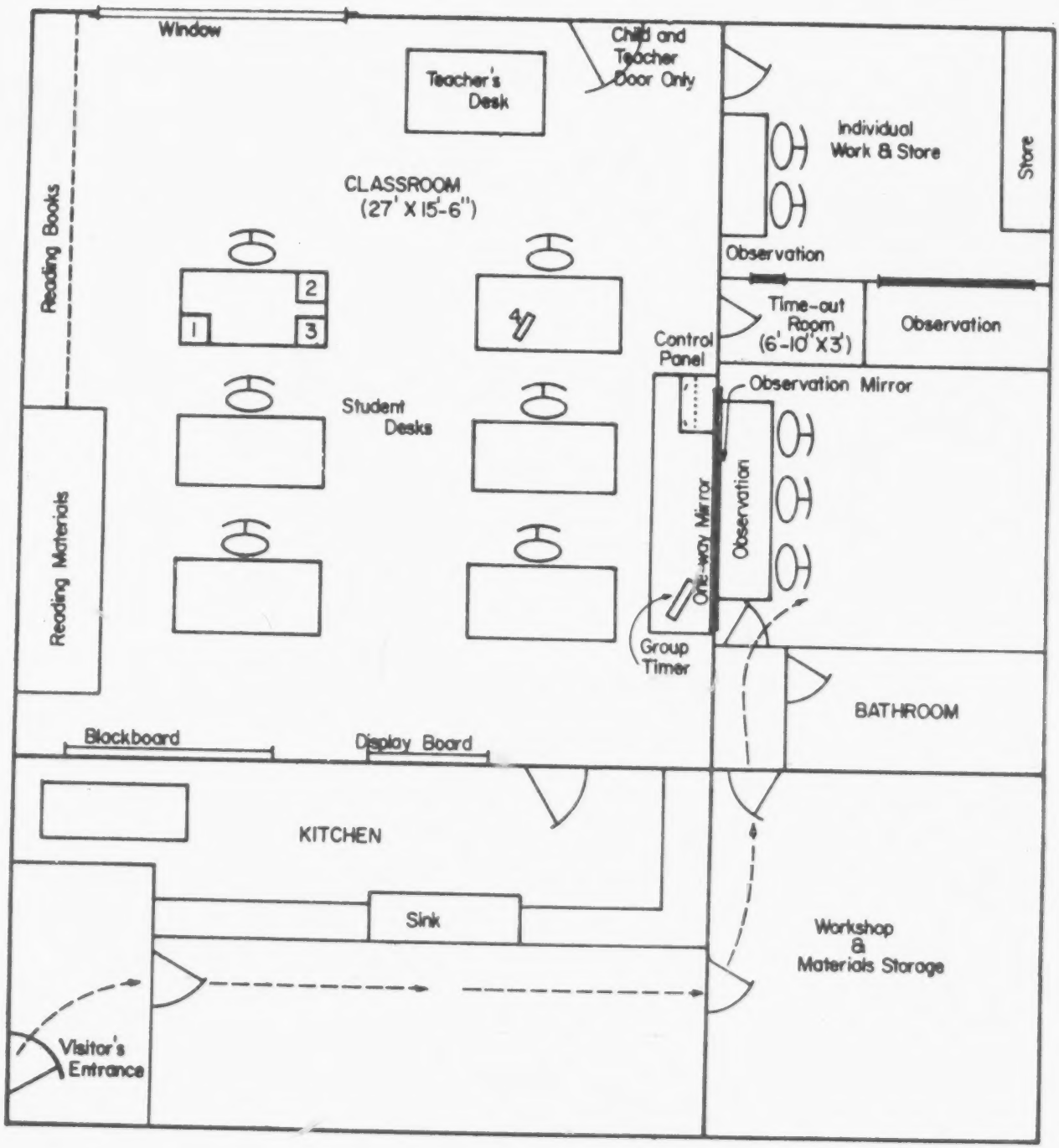
GRADE EQUIVALENT CHANGE SCORES
IN ACHIEVEMENT FOR EXPERIMENTAL
SUBJECTS DURING INTERVENTION
(GATES-MCKILLOP READING DIAGNOSTIC TEST)

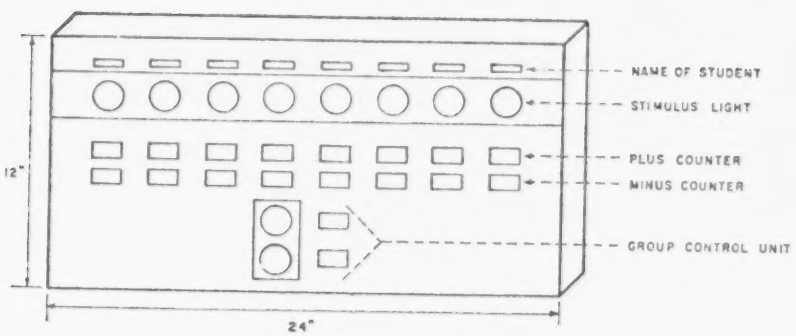
	Pre-test	Post-test	
	Form I	Form II	Gain
S_1	*	1.6	--
S_2	2.6	3.0	.4
S_3	*	1.6	--
S_4	1.9	2.1	.2
S_5	1.6	2.3	.7
		Average Gain	.43

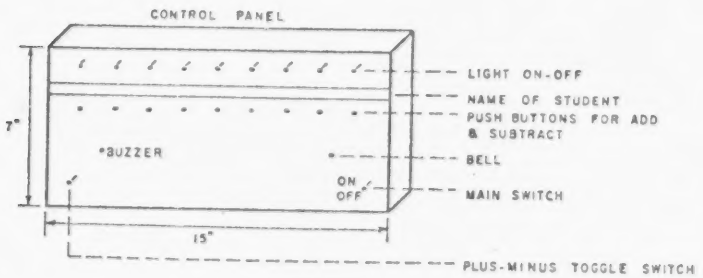
*not measurable

Figure Captions

Fig. 1	Schematic Diagram of Treatment Setting
Fig. 2	Electronic Display Board for Monitoring Reinforcement and Cost Contingency Procedures
Fig. 3	Form for Recording Application of Cost Contingency to Deviant Classroom Behaviors
Fig. 4	Functional Analysis of Treatment Model Components
Fig. 5	Daily Percentages of Appropriate Behavior for Subjects During Follow-up
Fig. 6	Teacher Attention to Inappropriate Behavior During Baseline and Follow-up
Fig. 7	Mean Percentage of Appropriate Behavior for Experimental Subjects During Successive Weeks of Treatment
Fig. 8	Percentage of Appropriate Behavior Per Observation Session During Baseline and Treatment
Fig. 9	Percentage of Change by Behavior Category from Baseline to Treatment

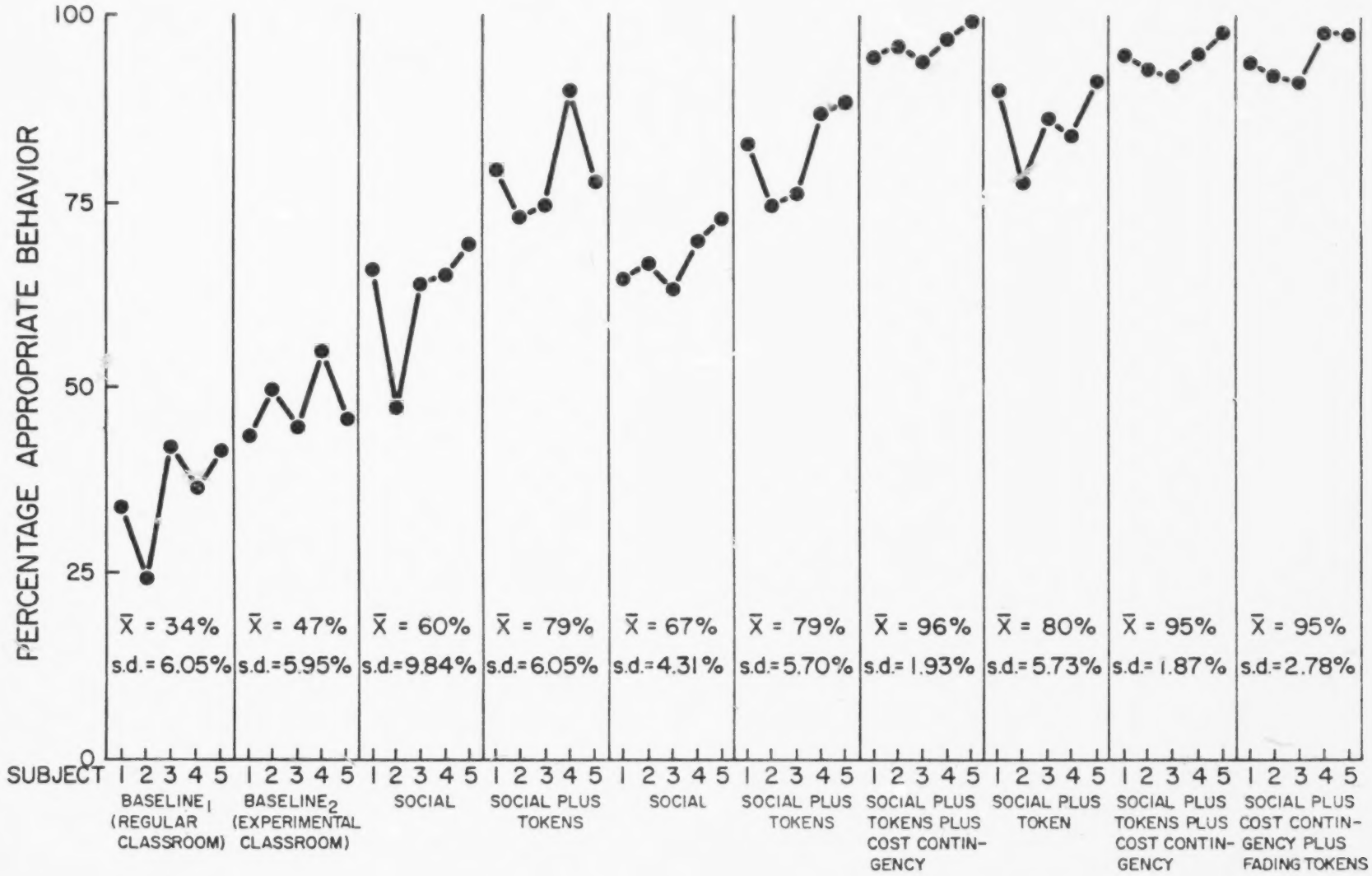

Window
Child and Teacher Door Only
Teacher's Desk
Individual Work & Store
Store
CLASSROOM (27' X 15'-6")
Reading Books
Observation
Time-out Room (6'-10" X 3')
Observation
Control Panel
Observation Mirror
Student Desks
Reading Materials
One-way Mirror
Observation
Group Timer
BATHROOM
Blackboard
Display Board
KITCHEN
Sink
Workshop & Materials Storage
Visitor's Entrance

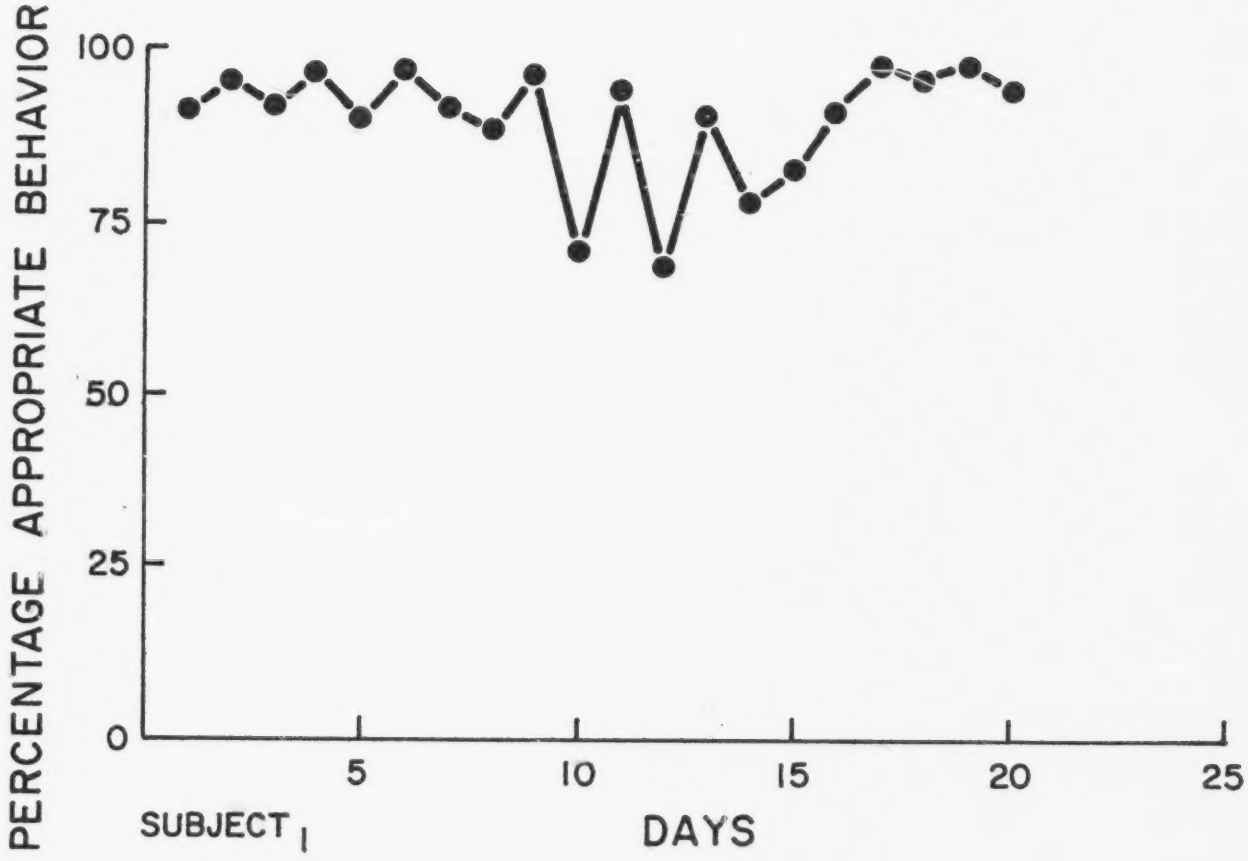

NAME OF STUDENT
STIMULUS LIGHT
PLUS COUNTER
MINUS COUNTER
GROUP CONTROL UNIT
12"
24"

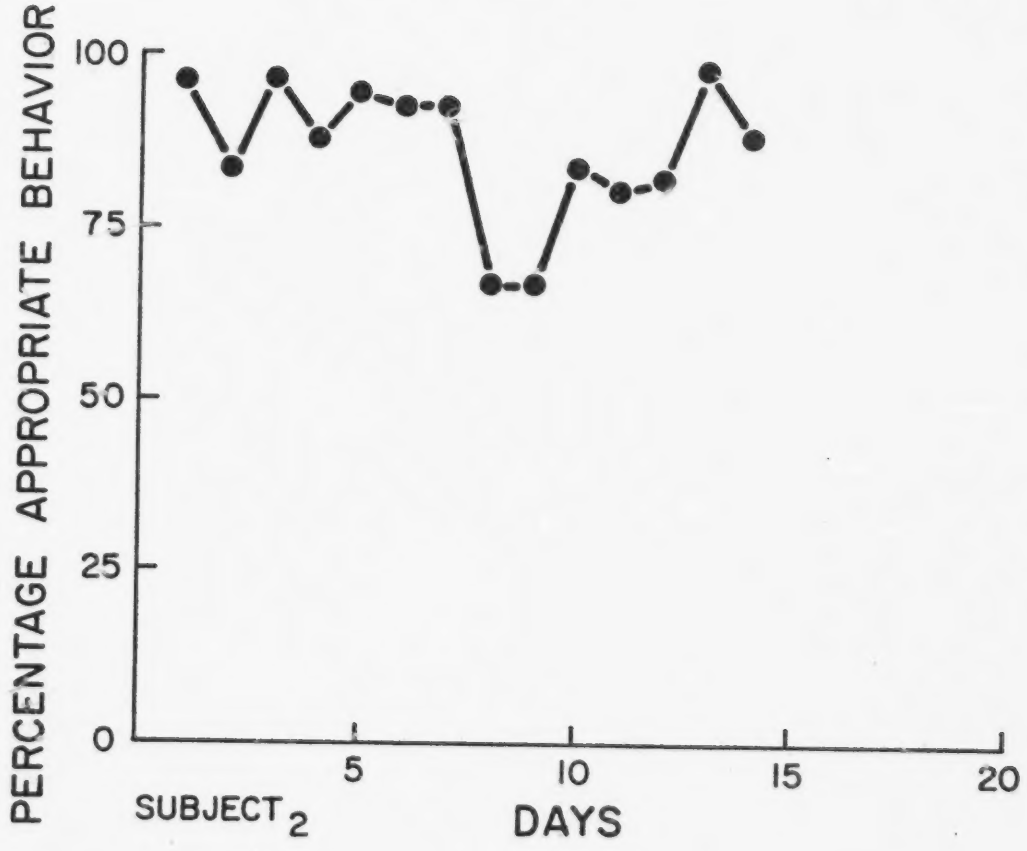

CONTROL PANEL
LIGHT ON-OFF
NAME OF STUDENT
PUSH BUTTONS FOR ADD & SUBTRACT
BELL
MAIN SWITCH
PLUS-MINUS TOGGLE SWITCH
*BUZZER
ON
OFF
7"
15"

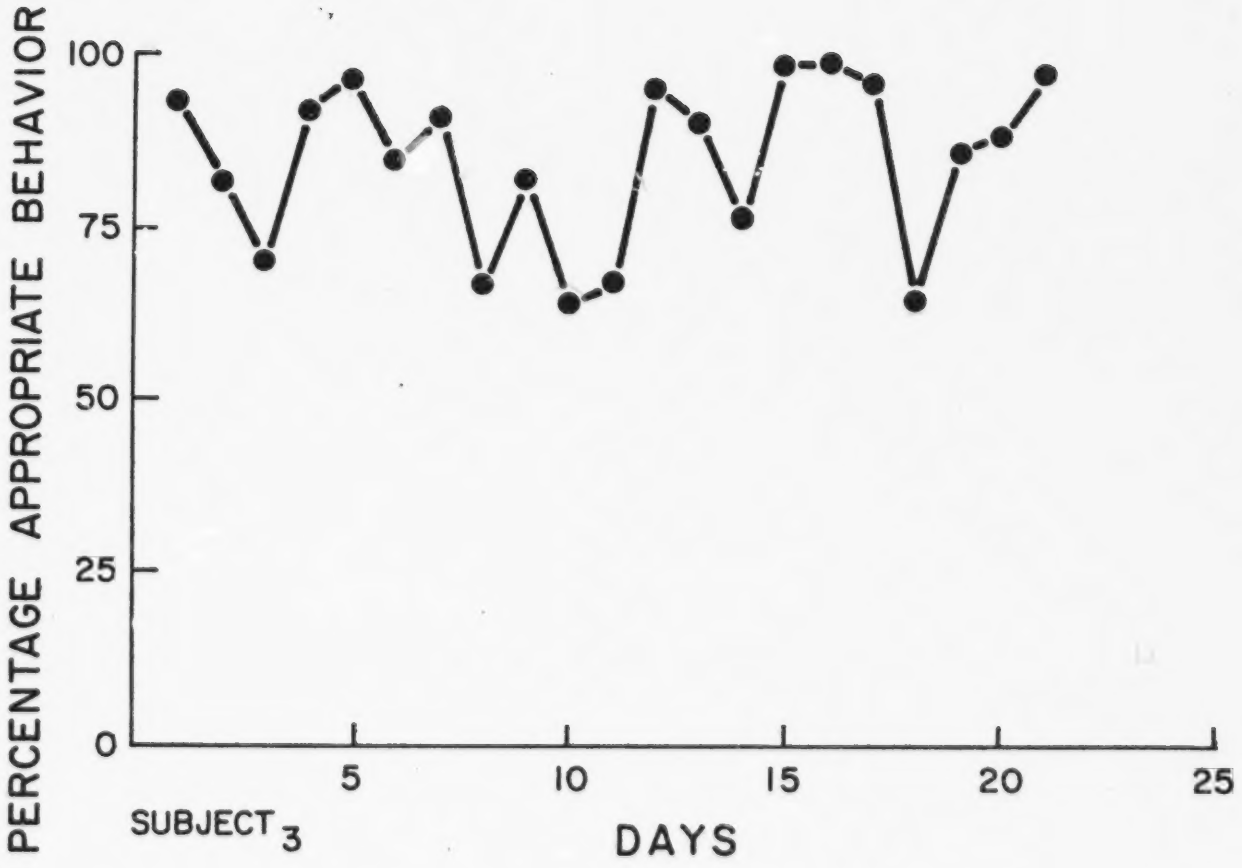
FORM FOR RECORDING COST CONTINGENCY
EVENTS DURING TREATMENT

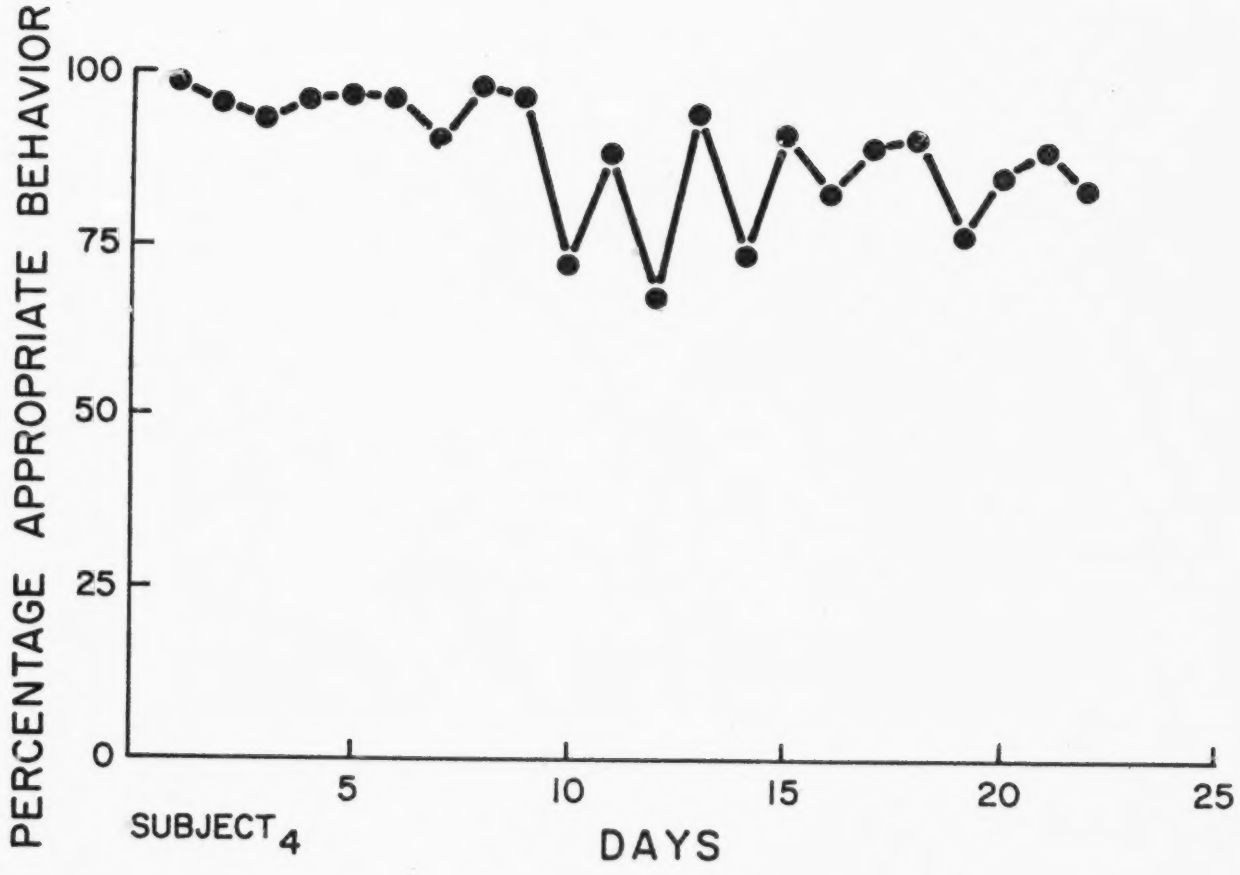
BEHAVIOR	POINT LOSS	M	T	W	Th	F	M	T	W	Th	F
Talk Back	1										
Talk-outs	1										
Not attending	1										
Fighting or throwing objects	4										
Swearing or cursing	3										
Out of seat	1										
Teacher defiance	2										
Disrupting/disturbing others (Ignore + 1)	1										
Playing with objects	1										

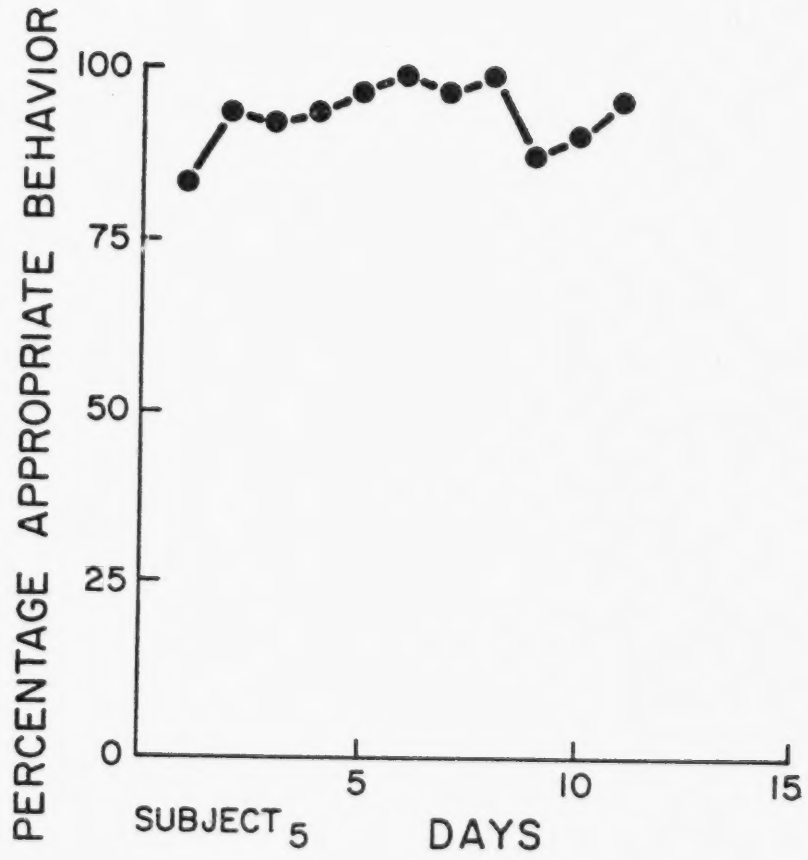

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
0
SUBJECT 1 2 3 4 5
X̄ = 34%
s.d. = 6.05%
BASELINE1 (REGULAR CLASSROOM)
X̄ = 47%
s.d.=5.95%
BASELINE2 (EXPERIMENTAL CLASSROOM)
X̄ = 60%
s.d.=9.84%
SOCIAL
X̄ = 79%
s.d.=6.05%
SOCIAL PLUS TOKENS
X̄ = 67%
s.d.=4.31%
SOCIAL
X̄ = 79%
s.d.=5.70%
SOCIAL PLUS TOKENS
X̄ = 96%
s.d.= 1.93%
SOCIAL PLUS TOKENS PLUS COST CONTINGENCY
X̄ = 80%
s.d.=5.73%
SOCIAL PLUS TOKEN
X̄ = 95%
s.d.= 1.87%
SOCIAL PLUS TOKENS PLUS COST CONTINGENCY
X̄ = 95%
s.d.=2.78%
SOCIAL PLUS COST CONTINGENCY PLUS FADING TOKENS

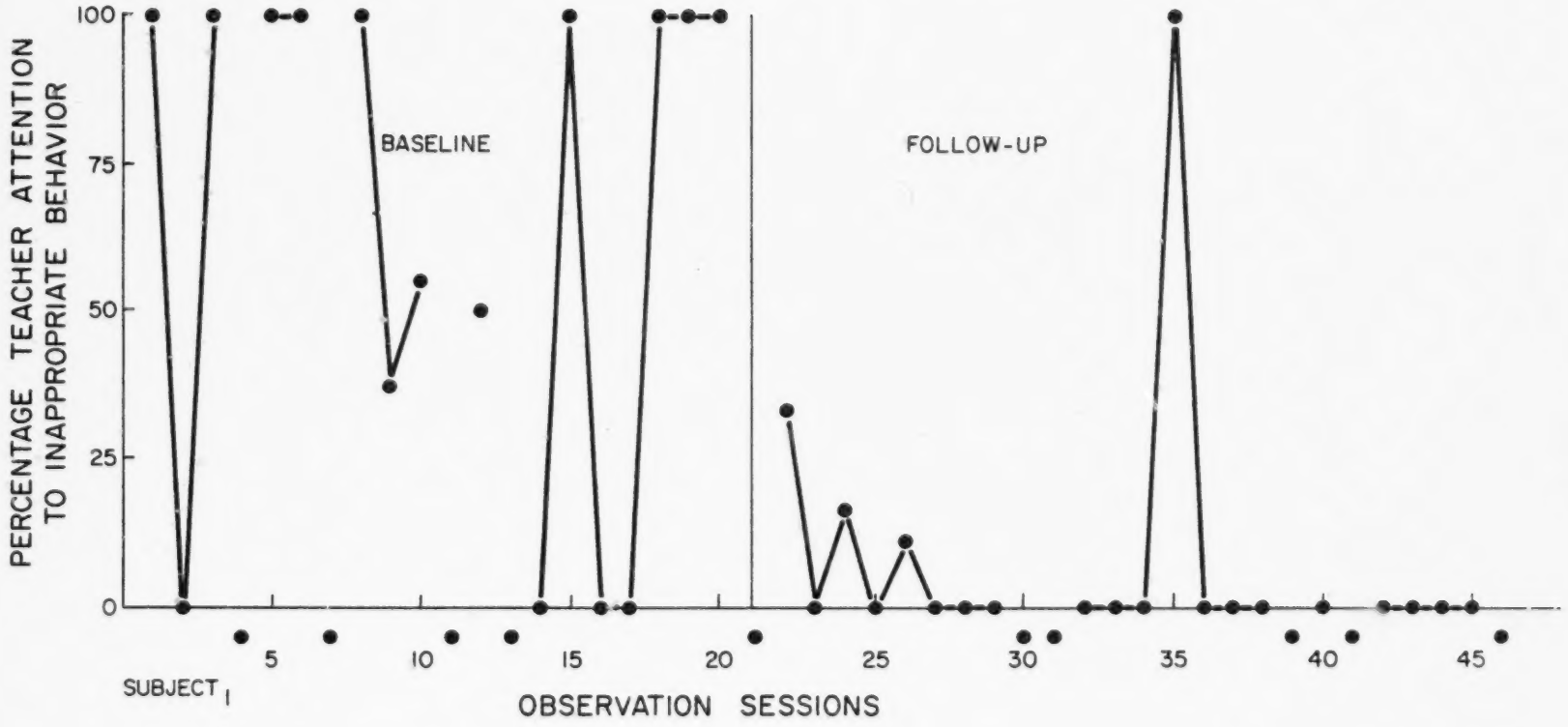

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
0
5
10
15
20
25
SUBJECT 1
DAYS

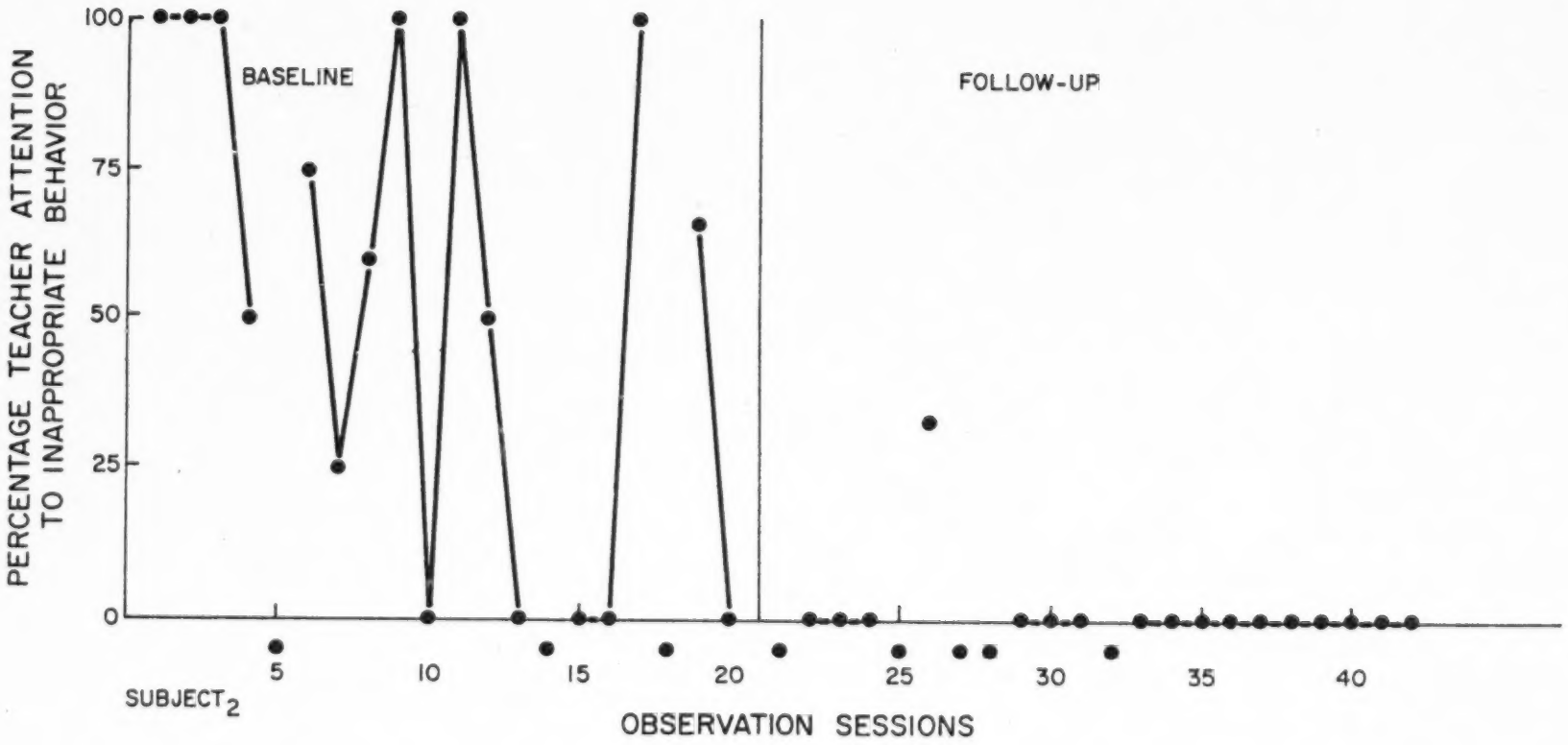

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
0
5
10
15
20
SUBJECT 2
DAYS

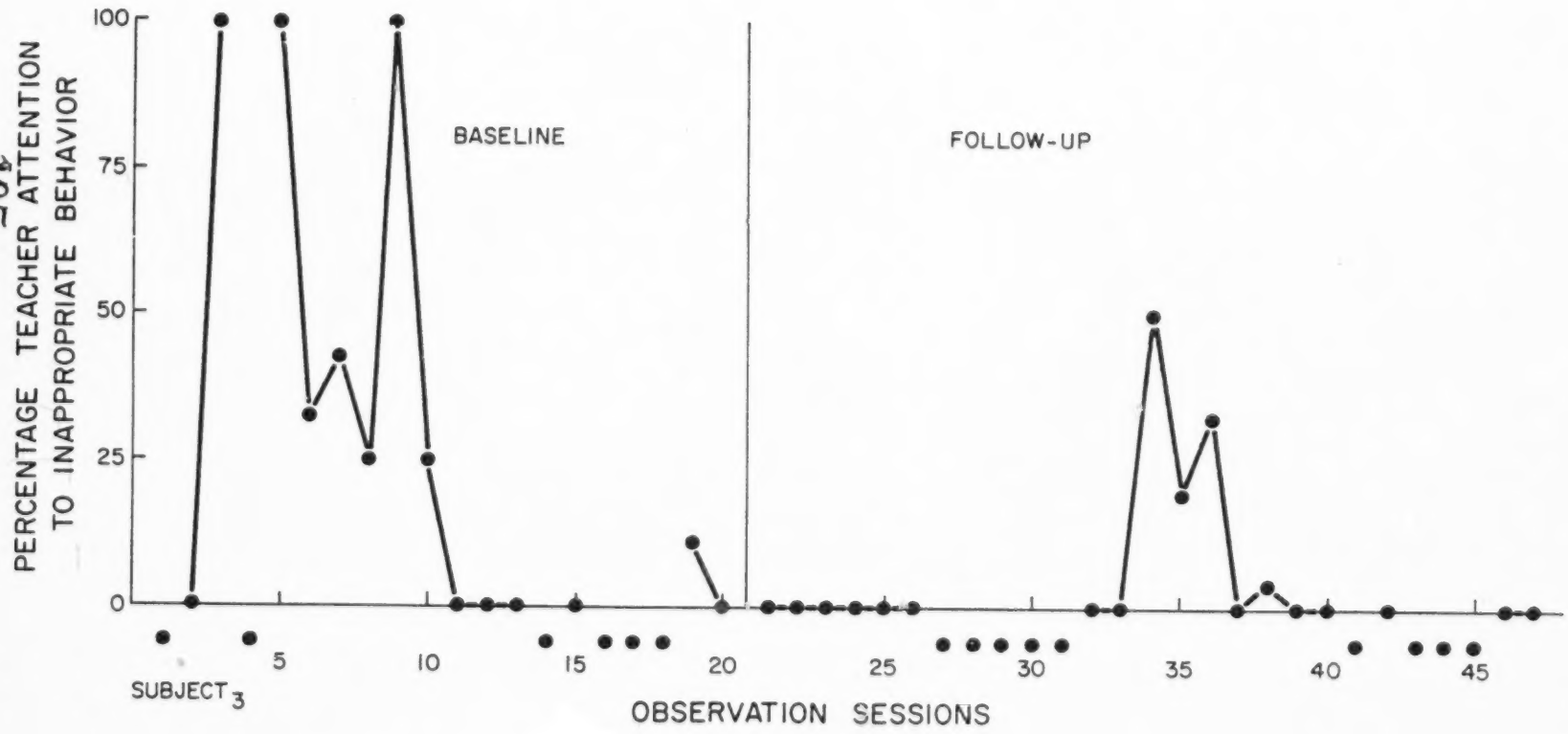

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
0
5
10
15
20
25
SUBJECT 3
DAYS

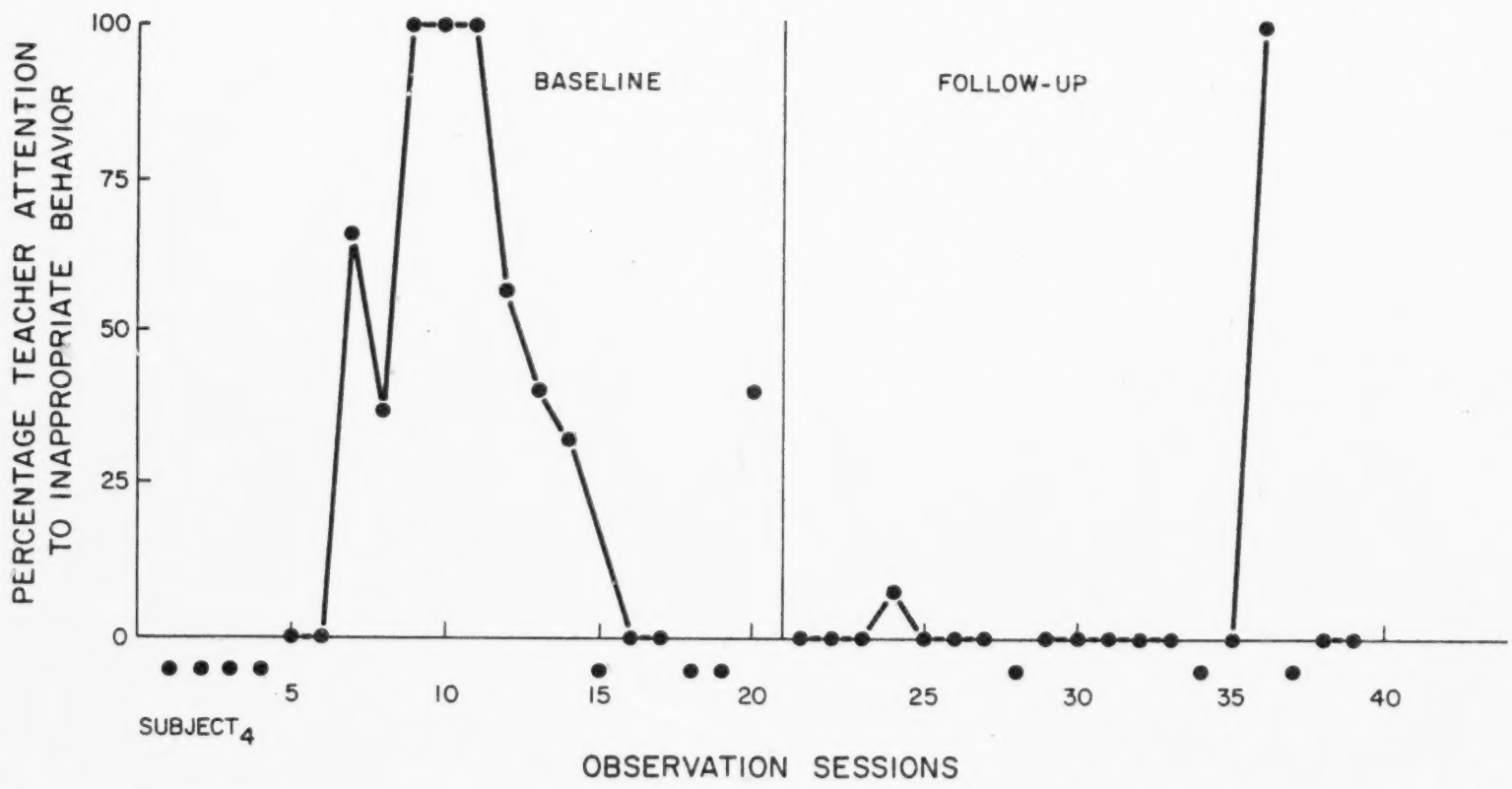

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
0
5
10
15
20
25
SUBJECT 4
DAYS

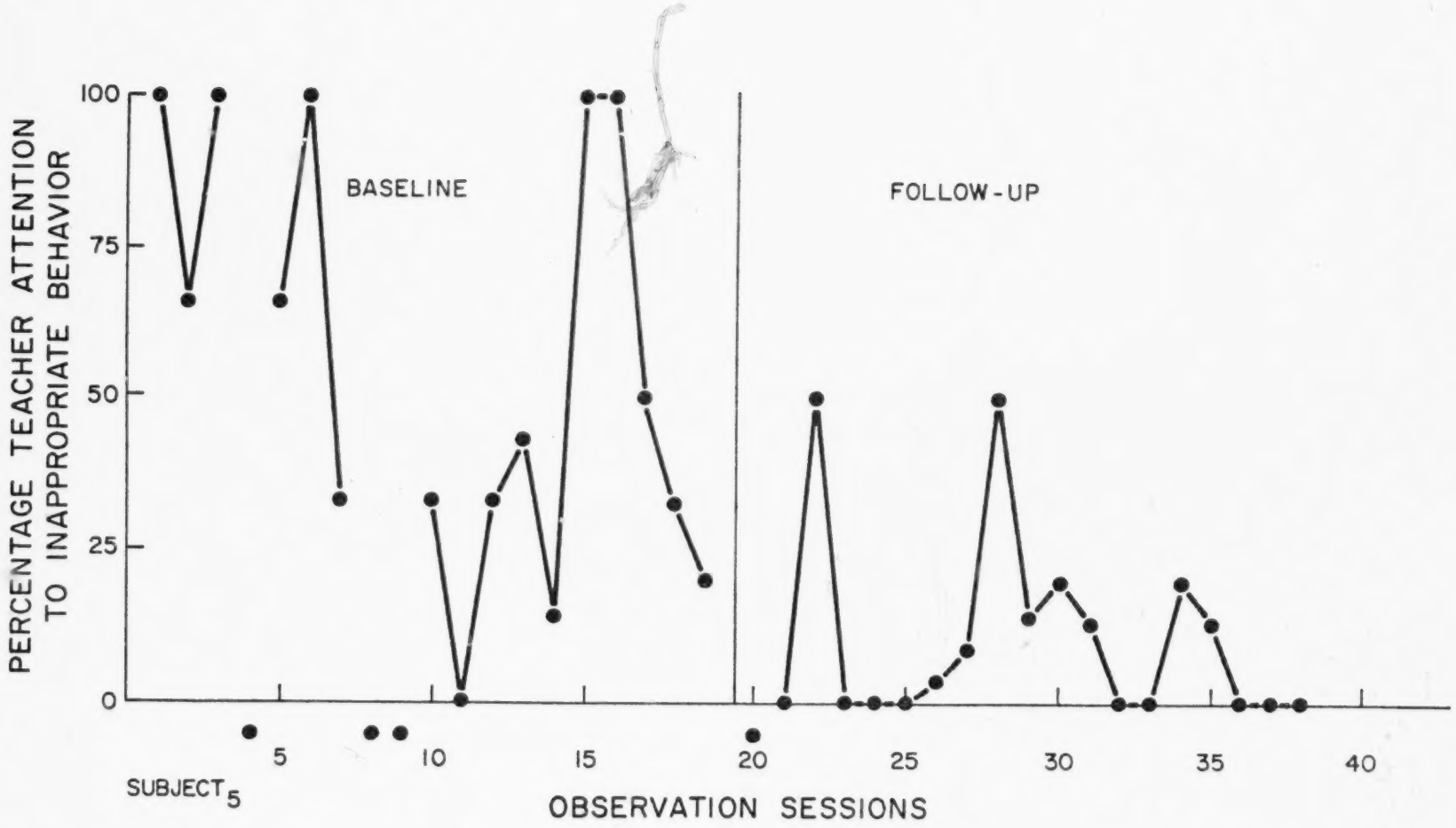

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
0
5
10
15
SUBJECT 5
DAYS


100
75
50
25
0
PERCENTAGE TEACHER ATTENTION TO INAPPROPRIATE BEHAVIOR
BASELINE
FOLLOW-UP
5
10
15
20
25
30
35
40
45
SUBJECT 1
OBSERVATION SESSIONS


PERCENTAGE TEACHER ATTENTION TO INAPPROPRIATE BEHAVIOR
100
75
50
25
0
BASELINE
FOLLOW-UP
5
10
15
20
25
30
35
40
SUBJECT 2
OBSERVATION SESSIONS


PERCENTAGE TEACHER ATTENTION TO INAPPROPRIATE BEHAVIOR
100
75
50
25
0
BASELINE
FOLLOW-UP
5
10
15
20
25
30
35
40
45
SUBJECT 3
OBSERVATION SESSIONS


PERCENTAGE TEACHER ATTENTION TO INAPPROPRIATE BEHAVIOR
100
75
50
25
0
BASELINE
FOLLOW-UP
5
10
15
20
25
30
35
40
SUBJECT 4
OBSERVATION SESSIONS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50
25
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BASELINE
FOLLOW-UP
5
10
15
20
25
30
35
40
SUBJECT 5
OBSERVATION SESSIONS

MEAN PERCENT APPROPRIATE BEHAVIOR
100
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96
94
92
90
1
2
3
4
5
6
7
8
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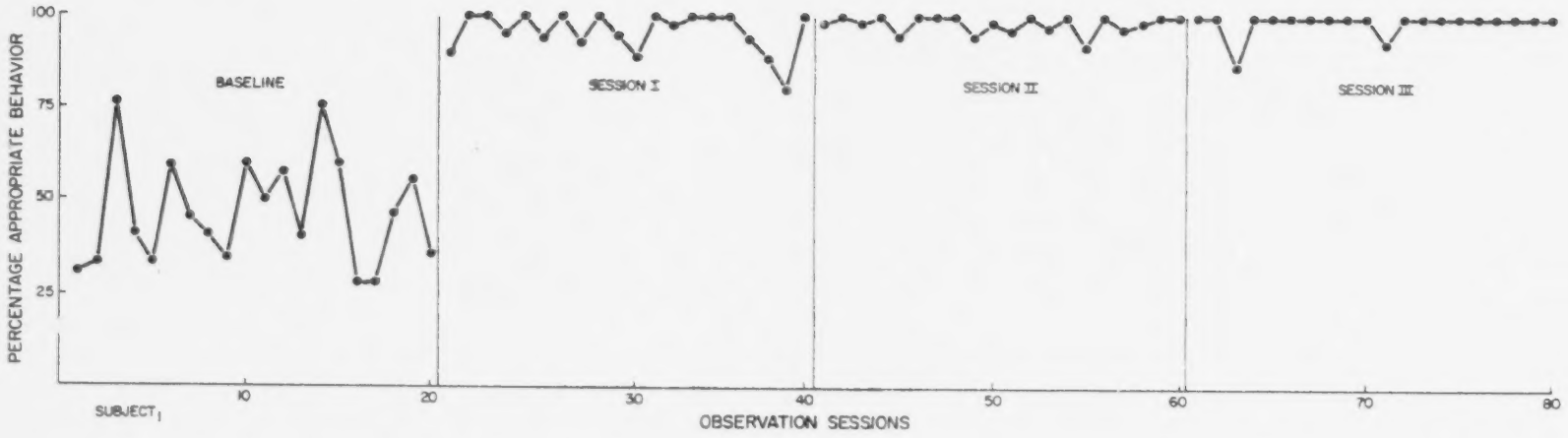
10
11
WEEKS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75
50
25
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SESSION I
SESSION II
SESSION III
10
20
30
40
50
60
70
80
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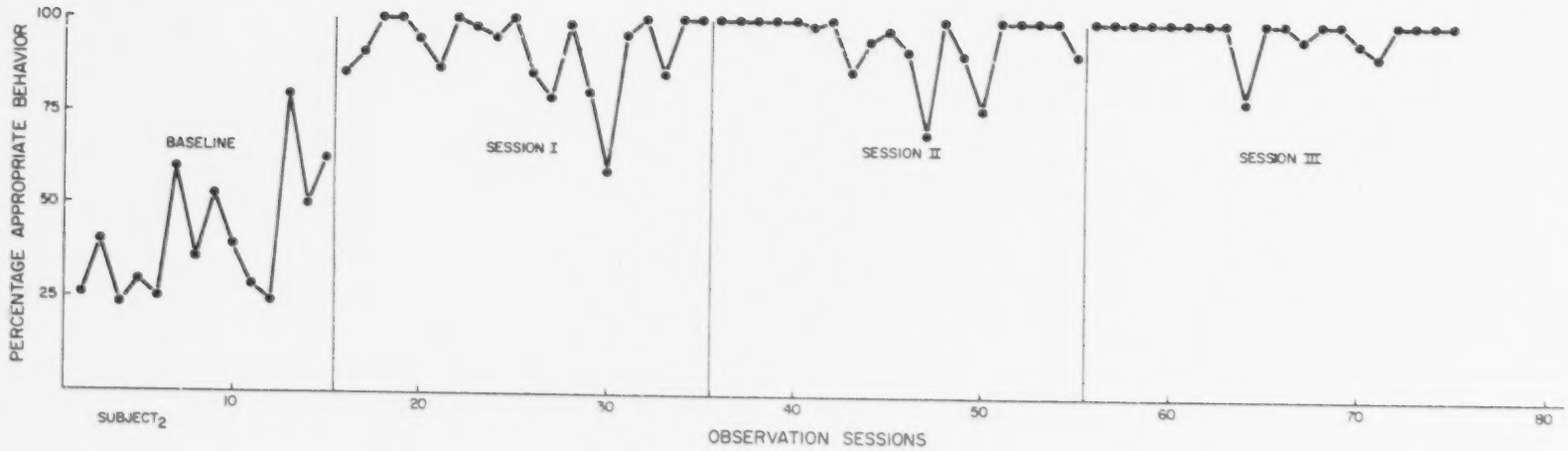
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75
50
25
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SESSION I
SESSION II
SESSION III
SUBJECT2
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30
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50
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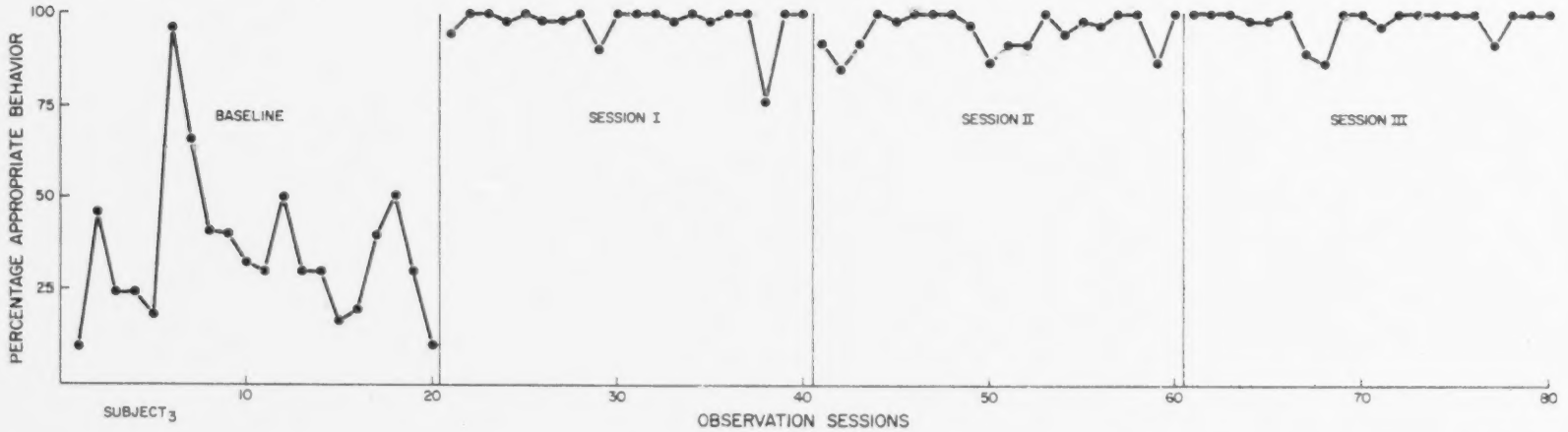
70
80
OBSERVATION SESSIONS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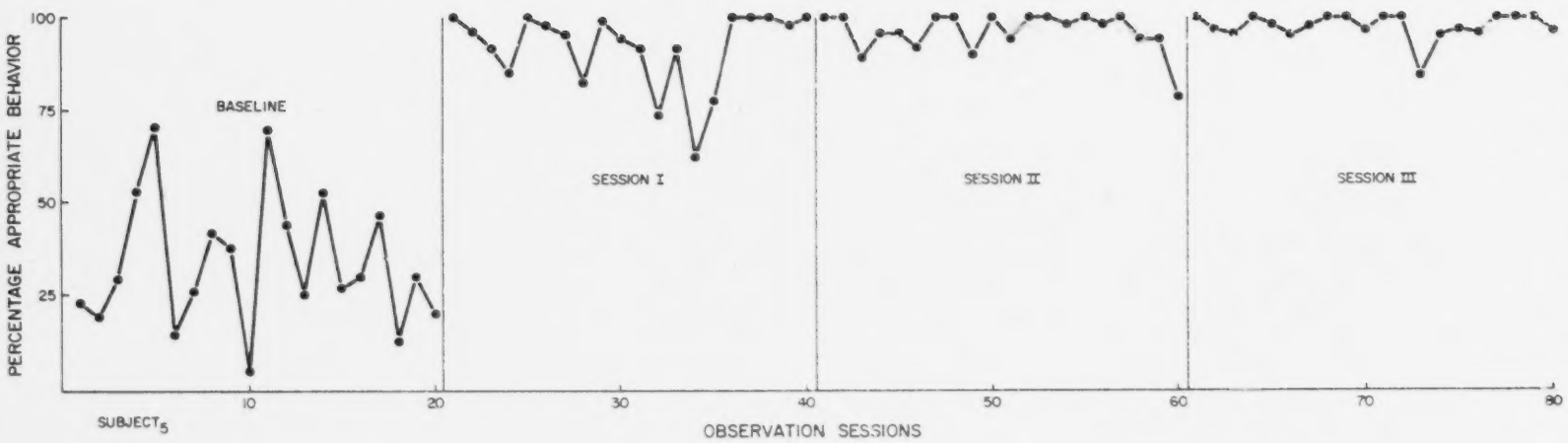
75
50
25
BASELINE
SESSION I
SESSION II
SESSION III
10
20
30
40
50
60
70
80
SUBJECT 3
OBSERVATION SESSIONS

PERCENTAGE APPROPRIATE BEHAVIOR
100
75
50
25
SUBJECT 4
BASELINE
SESSION I
SESSION II
SESSION III
10
20
30
40
50
60
70
80
OBSERVATION SESSIONS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100
75
50
25
BASELINE
SESSION I
SESSION II
SESSION III
10
20
30
40
50
60
70
80
SUBJECT 5
OBSERVATION SESSIONS

PERCENTAGE OF BEHAVIOR
00
10
20
30
40
50
SUBJECT I
APPROPRIATE
INAPPROPRIATE
WORK
NORM-ATIVE
NON AT-TEND-ING
NOISY
VOCALIZ-ATION
PHYSICAL
MOVE-MENT
Baseline
Intervention
5.96 %
5.00 %
.41 %
40.19 %
7.26 %
23.46 %
1.77 %
9.9 %
9.61 %
.00 %
5.76 %
10.19 %
.03 %
8.36 %
.67 %
.00 %
.00 %
.00 %
6.92 %
22.40 %
1.25 %
40.71 %

PERCENTAGE OF BEHAVIOR
00
10
20
30
40
50
SUBJECT 2
APPROPRIATE
INAPPROPRIATE
WORK
NORM-ATIVE
NON AT-TEND-ING
NOISY
VOCALIZ-ATION
PHYSICAL
MOVE-MENT
Baseline
Intervention
5.30 %
13.42 %
.17 %
36.71 %
16.19 %
12.82 %
11.70 %
1.37 %
4.80 %
.05 %
3.13 %
14.20 %
.08 %
11.63 %
.02 %
.00 %
.00 %
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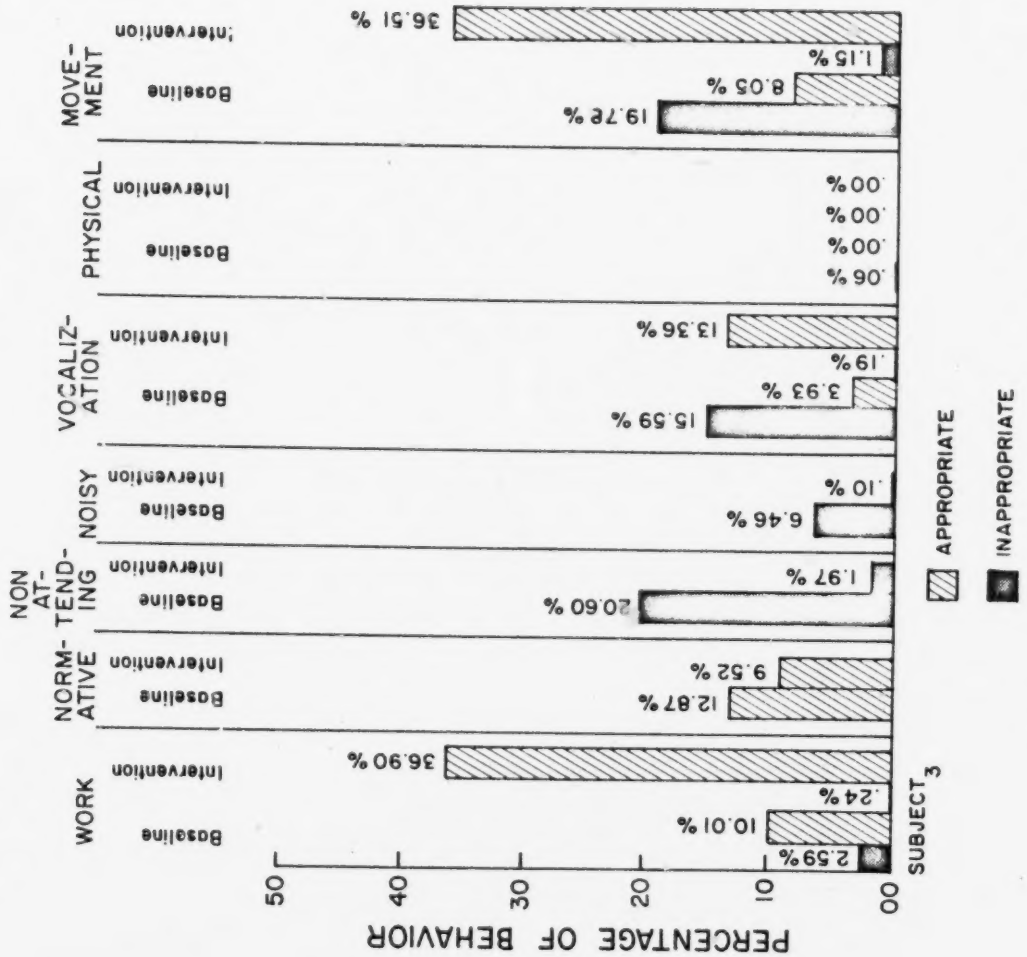
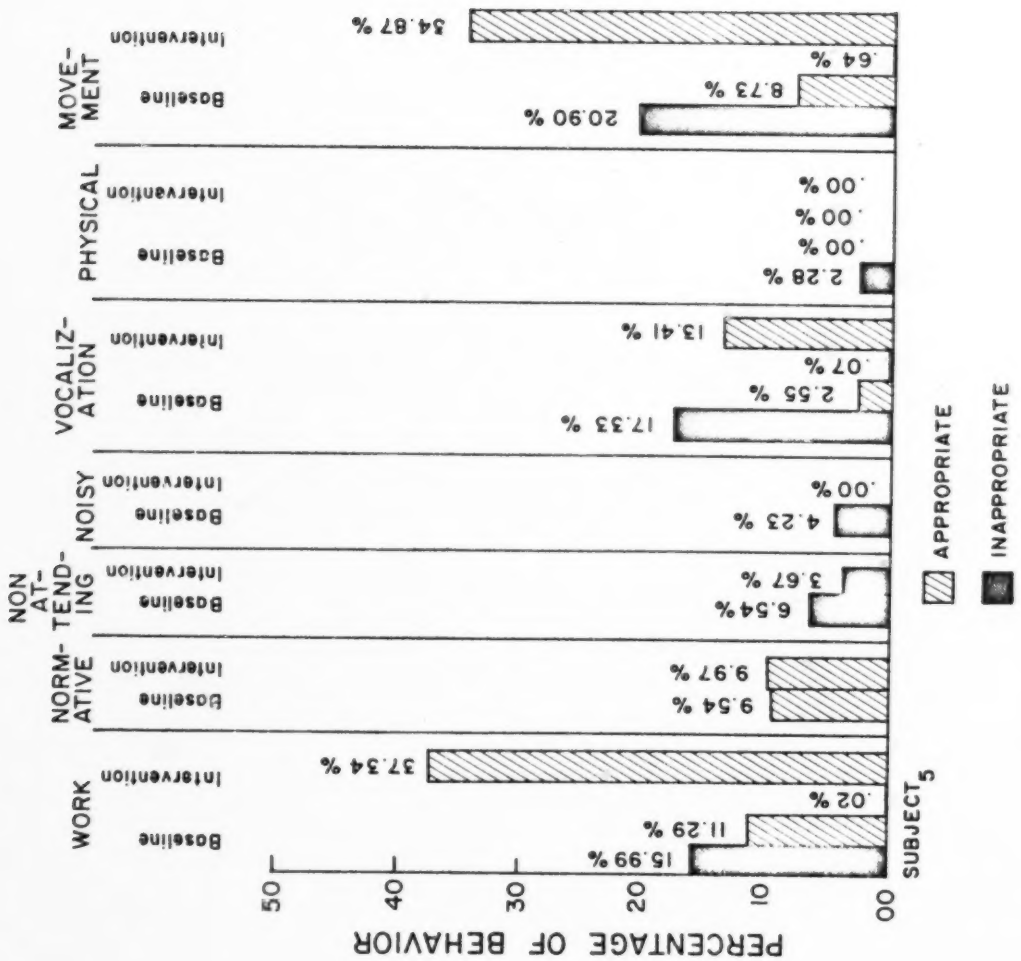
18.80 %
11.98 %
.37 %
36.76 %


PERCENTAGE OF BEHAVIOR
00
10
20
30
40
50
SUBJECT 3
APPROPRIATE
INAPPROPRIATE
WORK
Baseline
2.59%
.24%
Intervention
10.01%
36.90%
NORM-ATIVE
Baseline
12.87%
Intervention
9.52%
NON AT-TEND-ING
Baseline
20.60%
Intervention
1.97%
NOISY
Baseline
6.46%
Intervention
.10%
VOCALIZ-ATION
Baseline
15.59%
3.93%
Intervention
.19%
13.36%
PHYSICAL
Baseline
.06%
.00%
.00%
.00%
Intervention
MOVE-MENT
Baseline
19.78%
8.05%
Intervention
1.15%
36.51%

PERCENTAGE OF BEHAVIOR
00
10
20
30
40
50
SUBJECT 4
APPROPRIATE
INAPPROPRIATE
WORK
NORM-ATIVE
NON AT-TEND-ING
NOISY
VOCALIZ-ATION
PHYSICAL
MOVE-MENT
Baseline
Intervention
1.22 %
9.76 %
.19 %
36.55 %
14.37 %
13.38 %
17.08 %
1.73 %
5.89 %
.10 %
16.06 %
5.08 %
.04 %
10.59 %
1.15 %
.00 %
.00 %
.00 %
20.67 %
8.67 %
1.12 %
38.77 %


PERCENTAGE OF BEHAVIOR
00
10
20
30
40
50
SUBJECT 5
APPROPRIATE
INAPPROPRIATE
WORK
Baseline
15.99 %
11.29 %
.02 %
Intervention
37.34 %
NORM-ATIVE
Baseline
9.54 %
9.97 %
Intervention
NON AT-TEND-ING
Baseline
6.54 %
3.67 %
Intervention
NOISY
Baseline
4.23 %
.00 %
Intervention
VOCALIZ-ATION
Baseline
17.33 %
2.55 %
.07 %
Intervention
13.41 %
PHYSICAL
Baseline
2.28 %
.00 %
.00 %
.00 %
Intervention
MOVE-MENT
Baseline
20.90 %
8.73 %
.64 %
Intervention
34.87 %

PERCENTAGE OF BEHAVIOR
00
10
20
30
40
50
ALL SUBJECTS
APPROPRIATE
INAPPROPRIATE
WORK
NORM-ATIVE
NON AT-TEND-ING
NOISY
VOCALIZ-ATION
PHYSICAL
MOVE-MENT
Baseline
Intervention
6.2%
9.89%
.17%
37.56%
13.29%
10.59%
13.16%
2.10%
6.20%
.05%
14.67%
4.09%
.08%
11.47%
1.00%
.00%
.00%
.00%
20.51%
8.87%
.91%
37.52%

Appendix A

CODE DEFINITIONS AND AGENT RESPONSES

Description of Codes

Classroom Behaviors

WK (Individual Work): Appropriate - Inappropriate
Appropriate work is coded in the lower half of the square whenever the subject is engaging in the prescribed individual work. The class is working in its Math workbooks and the subject is involved in the same activity--he has the workbook in front of him and is attending to the problems.
Inappropriate work is coded in the upper half of the square whenever the subject is engaging in activity other than the prescribed work indicated by the teacher. The teacher has told the class to read the story on page 25 of their readers. The subject, instead, continues his drawing from the last period. It is important to note that the observer should not code nonattending (NA) while coding inappropriate work, such as cheating, flipping through pages unnecessarily, or sharpening a pencil for a long length of time, unless the subject is not attending to this inappropriate work.

NO (Group Activity): To be coded whenever subject engages in behavior characterized by group activity or transitional phases; i.e., moving chairs to form reading group, raising hand to answer or ask a question, putting away math book and getting out reading book, lining up for recess or fire drill, listening to teacher's instructions and group discussions. It is important to note that a child may be doing individual work within special study groups, unless the members are working together, this should be coded (WK).

NA (Nonattending): To be coded whenever the subject is not attending to his work or class lesson. This may occur during WK or NO, when the subject should be attending. This involves looking up from his work on his desk, looking out the window during a class lecture, or resting his head on the desk while he should be attending. This behavior is always classified as inappropriate.

NY (Noise - nonverbal): To be coded whenever the subject engages in loud, disruptive noises; i.e., banging book on desk, kicking desk, mumbling, and incoherent utterances. This category is always coded as inappropriate and usually accompanies movement (MO).

VO (Vocalization): Appropriate - Inappropriate
To be coded whenever the subject is engaged in coherent vocalizations that are not considered noise; i.e., singing, talking to one's self or to others.
Appropriate vocalizations are coded in lower half of the square and include: talking to teacher or peer with permission.
Inappropriate vocalizations are coded in the upper half of the square and include: talking to peer about topics other than the lesson, talking without permission, talking to disrupt and annoy others in the class.
While coding VO square, the observer must record:

1. The agent addressed by the subject.
2. The agent's response to the subject.
3. The agent who responded to the subject.

In most cases, the agent is the same in items one and three; however, the subject may direct a statement to a peer but the teacher actually responds by disapproval, in this case, the code will look like this PDT under inappropriate VO. Other cases may show double responses to the same VO, as in the example above, the peer attends to the subject and the teacher disapproves, the coding will look like this APDT. (Frequently a child may mouth words while reading; this is not considered vocalization.)

PH (Physical Contact + or -): Appropriate - Inappropriate
To be coded whenever subject engages in physical contact with others. Contact may be regarded as either positive (+); i.e., placing an arm around peer, or negative (-); i.e., striking peer or teacher.
Inappropriate contact is coded in the upper half of the square and indicates annoying or disruptive behavior or is inappropriate at the time. The subject touches every peer he passes returning to his desk after sharpening his pencil; or he taps peer sitting in front of him for attention. Appropriate contact is coded in the lower half of the square whenever subject touches others in a situation permitting contact; i.e., games. Aggression, actual or attempted, is coded as negative (-) and inappropriate. Subject strikes peer or attempts to strike peer but is stopped by the teacher.

MO (Movement): Appropriate - Inappropriate
To be coded whenever subject is moving in his chair; i.e., squirming, turning around, raising hand, or following motor instructions from teacher. Movements are considered appropriate or inappropriate. Getting out of seat or not touching seat and standing at desk are coded by placing an X in the square under Movement.

IS (Vocal Initiation to Subject):
To be coded whenever an agent, either the teacher (T) or a peer (P), addresses the subject or replies to the subject. Always code under IS in this manner:

1. Code the agent involved with the initiation.
2. Code the subject's response to the agent's initiation.

Appropriate initiations are coded in lower half of IS square and entail statements or dialogues between teacher and subject and talking between peer and subject approved by the teacher. Inappropriate initiations are characterized by a peer disrupting the subject from his work or conversations between peer and subject without teacher permission.

Responses

A (Attention): To be coded whenever agent attends to specified behavior. This is considered a neutral response, void of approval or disapproval. The teacher looks at or listens to the subject.

P (Praise): To be coded whenever response agent displays approval of subject's behavior. This may be through a verbal response or a gesture; i.e., "That's nice," head nod, smile.

D (Disapproval): To be coded whenever peer or teacher indicates disgust or disapproval of subject's behavior. Responses may be verbal or gestural; i.e., "Don't do that!", head shake, frown.

O (Ignore): To be coded whenever a behavior occurs by the subject and there is no response from the teacher or peers. Under IS, an agent may initiate to the subject and be ignored.

C (Compliance): The subject responds to teacher or peer initiated command.

NC (Noncompliance): The subject does not comply with teacher or peer initiated command.

PH (Physical + or -): To be coded whenever response agent responds to subject either by positive contact: hugging, patting; or by negative contact: hitting.

Appendix B

CONTRACT

Teacher Retraining and Follow-up Project

I. Teacher signs a contract with the project which contains the following provisions:

A. Teacher agrees to read and master programmed test: Modifying Classroom Behavior.

B. Teacher agrees to take a review test over text and achieve a passing score of 90% correct. If criterion is not met on first try, teacher re-reads book and retakes test until 90% criterion is achieved.

C. Teacher agrees to meet once a week with a project resource teacher to discuss applications of the principles in the book to the maintenance of the child's appropriate behavior.

D. The project will arrange for the teacher to receive six hours of University credit under the course title, Ed 505: Classroom Management Procedures and will pay her tuition provided that she completes the above task satisfactorily.

E. The teacher's grade in the course will depend upon the amount of maintenance of appropriate classroom behavior achieved between February 19, 1971 and June 1, 1971.

1. An A grade will be earned if the child maintains 85% or better of the average amount of appropriate behavior he produced while in the class at Condon.

2. A B grade will be earned if the child maintains between 85% and 75% of the average amount of appropriate behavior he produced while in the class at Condon.

3. A C grade will be earned if the child maintains 74% or less of the average amount of appropriate behavior he produced while in the class at Condon.

4. An observer will meet with the teacher once a week to provide feedback on how the child's behavior is maintaining relative to his average performance in the Condon class.

_____

Teacher

_____

Hill M. Walker, Project Director

Appendix C

Review Test for: Modifying Classroom Behavior (2nd Revision)

NAME_____ SCORE_____

*Circle the correct answer:

1. Most human behavior (is, is not) learned through interaction with one's environment.

2. Positive reinforcement (increases, decreases, does not affect) the probability that a response will occur again.

3. Janet is considered to be a very sensitive, frail little girl. She often cries in the classroom. If her teacher wishes to find out why she cries so often, she should: (circle one)

    1. send her to the school psychologist.
    2. try to cheer her up when she cries.
    3. ignore her crying.
    4. observe, record, and analyze the situations and events which precede and/or follow the crying episodes.
    5. keep her in for recess.

4. When the teacher says to one of her students, "Very good, you are doing fine work," she is using (positive token reinforcement, positive social reinforcement, negative social reinforcement).

5. Internal reinforcers, associated with performance of the task itself, in such activities as playing chess, reading, etc., are called (intrinsic, extrinsic).

6. The process of changing the environment stimulus(i) to reduce the chances of the behavior occurring is called (stimulus change, reinforcement, negative practice).

7. The interval of time between occurrence of the behavior being conditioned and the delivery of reinforcement to that behavior should be of (minimum duration, moderate duration, long duration, does not matter).

8. When a student is praised for every third correct answer, he is on a(n) (ratio, interval) schedule of reinforcement.

9. When extinction is <u>first</u> applied, the rate of the behavior being extinguished is likely to (increase, decrease).

10. Removing the child from a reinforcing environment, contingent upon deviant behavior; and placing him in a quiet, isolated room for a brief period of time is known as (timeout, response cost, stimulus change).

11. Reinforcing successive approximations to a final performance (target behavior) is known as (modeling, shaping, cueing).

12. Frank has an excellent sense of humor and likes to tell jokes, but he often interrupts the class to tell one of his stories. This usually results in much distraction from school work and laughter in the class. The teacher ends it all by telling Frank to save his funny stories until recess and asking him to get back to work. What is probably maintaining Frank's joke-telling behavior:

    1. his sense of humor.
    2. attention and laughter from peers.
    3. attention and reprimand(s) from the teacher.
    4. both 2 and 3
    5. neither 2 nor 3

13. Reinforcing incompatible behavior and punishment (are, are not) the same thing.

14. The best schedule of reinforcement for maintaining behavior over a long period of time is (continuous reinforcement, intermittent reinforcement).

15. The term reinforcing stimulus refers to an event that usually (precedes, follows) a response.

16. Evidence indicates that punishment if severe in intensity, (does, does not) bring about an abrupt, sometimes complete reduction in responding.

17. Extinction will be <u>most</u> rapid if the past reinforcement has been on a(n) (continuous schedule, intermittent schedule).

18. Mrs. Jones ignores Tony whenever he asks to go to the pencil sharpener (usually 6 to 8 times per day). If she continues to ignore him whenever he displays this behavior, Tony will probably eventually stop asking. This technique is known as (extinction, punishment, reinforcement).

19. If a teacher wishes to decrease out-of-seat behavior by using counter-conditioning techniques, she would reinforce (in-seat behavior, talk-outs, nonattending).

20. Modeling is <u>most</u> likely to occur when the observer sees the model (being reinforced, being punished, receiving no consequence) for emitting the behavior.

21. Continuous reinforcement is <u>most</u> important in the (early, later) stages of learning.

22. Changes in one's emotional state, e.g., from fear to anger (is, is not) an <u>observable</u> change in <u>overt</u> behavior.

23. The strength of behavioral events can be best and most reliably measured by:

    1. frequency with which the behavior occurs.
    2. intensity with which the behavior occurs.
    3. duration of the behavior.

24. Presenting a reinforcing stimulus at such a high rate that it is no longer desirable is known as (stimulus change, stimulus satiation, stimulus input).